

THE BRITISH ISLES

By

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translated and revised by

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TRANSLATOR'S FOREWORD

SINCE its publication in 1927, Monsieur A. Demangeon's work on the British Isles has necessarily occupied a place on the shelves of all serious students of Geography. Language difficulties, however, have stood in the way of its full use in this country, and it has been with a view to removing these that the present translation was undertaken. The task of translation naturally gave rise to many qualms and hesitations, but these have been relieved by the help which M. Demangeon's wide knowledge of the English language has made possible.

The version is more than an authorised translation : it is a new edition. M. Demangeon has carefully and thoroughly revised every page of his work in the light of recent developments in statistics, industry, movement of population, and other features of the Islands. Population statistics have been taken from the Census of 1931, except in the case of London, for which the estimates for 1938 have been supplied by local authorities, and of Ireland, whose figures are those of the Census of 1926. Trade returns are taken, unless otherwise stated, from official sources for 1937. Owing to the speed with which changes occur nowadays, it has been found necessary to bring some of the diagrams and matter up to date, and even some of the photographs have had to be replaced for the same reason.

I wish to express my thanks to M. Demangeon for his revision of my translation and to place on record the cordial relations which have existed between us during the period of collaboration. Among the many friends in this country who have assisted me, special thanks are due to my colleague, Mr. D. M. Reid, who read the typescript of Part I. and of Chapter VI ; to Professor Fleure, who read the chapter on Wales ; to Mr. D. Trevor Williams, who revised the section on South Wales and placed at my disposal some valuable material published by him ; to Mr. G. H. J. Daysh for his help with the chapter on the North of England ; to Mr. H. C. Darby, who checked the account of the Fen District ; to Mr. G. V. Carey for his careful revision of the proofs of the whole book ; and to Mr. R. Welldon Finn, whose knowledge of obscure detail concerning all parts of the British Isles was a constant and valuable check.

E. D. LABORDE.

HARROW-ON-THE-HILL,
August, 1939.

FOREWORD TO THE SECOND EDITION

MUCH has happened in the ten years since this translation was first published, and revision has been necessary. Most of the changes are in matters economic, and here a twofold difficulty has arisen. In the first place, the country's statistics have been in an abnormal condition since 1939, and it was questionable whether such figures were suitable for a book of this kind. In the second place, most Government departments now issue their statistics in a different form from that used in 1939. Hence, tables cannot easily be revised, and comparisons between recent figures and those for pre-war years can seldom be made. However, the difficulties have been solved—satisfactorily, it is to be hoped.

M. Demangeon was no longer with us to undertake the revision, for he died soon after the German occupation of Paris and indirectly on account of it. I have tried to carry out the revision in a manner of which I hope he would have approved.

E. D. L.

Harrow-on-the-Hill.

PREFACE

By G. H. J. DAYSH,

Reader in Geography at King's College, University of Durham.

THE series of geographical publications to which the original French edition of this book belongs is one which has been acknowledged as of outstanding quality and of considerable value. In the foreword to the first volume (published in 1927) Professor L. Gallois paid eloquent tribute to Vidal de la Blache as the inspirer of the series and demonstrated the decisiveness of his influence on French geography. It was asserted, with complete justification, that by reason of the influence of la Blache, the unity of the several volumes comprising the whole series would be achieved.

It is not my present task, however, to dwell upon the merits of the series which reflects so adequately the harmony and outlook of the French school of geography. I must pay particular attention to this volume on the British Isles by Professor Albert Demangeon, translated from the French by Dr. E. D. Laborde in collaboration with the author.

When one recalls how many and rapid were the changes in the years preceding the publication of '*Les Iles Britanniques*' as the first volume of '*Géographie Universelle*', the nature of the task which confronted Professor Demangeon at that time can be fully appreciated. The Great War had delayed the fulfilment of the original plans for the series and the circumstances arising in the immediate post-war years presented many problems. Yet the difficulties were overcome and the resultant production was without question a masterly piece of work.

The original French edition appeared at a time when there seemed to be some reason for assuming that relatively normal conditions in this country were likely to be established. Whether or no a condition of normality has in fact ever been attained in this country over the post-war period would appear open to question. What is quite definite is that changes of a political and economic character have continued to be frequent and significant, and the process of adjustment is as yet by no means complete.

There are certain additional facts to which attention may be drawn. British geographers encounter many difficulties concerned

with the nature of statistical information relating to the British Isles. The very character of the statistics and the non-coincidence of the administrative 'regions' upon which many are based produce complexities which are troublesome enough to British geographers, and our sympathies must be extended to workers of other countries who have occasion to use these statistics. It may be noted also that during recent years there has been an increase rather than a decrease in the output of geographical material relating to the British Isles. As with statistical data, this material not infrequently shows a lack of co-ordination. It is published in many varied forms, and to keep pace with the swelling stream is no mean accomplishment.

In consequence, therefore, the task of Professor Demangeon and Dr. Laborde in producing this English translation, with due regard to the necessity of revision, has been formidable. Harmonious collaboration has led, however, to the issue of this book in such a form that, while the material has been brought up to date as far as circumstances allow, the spirit and character of the original have in large measure been retained. This is of great importance; since it is vital, in my opinion, that the many students of Geography in this country should be aided, through this translation of the work of a French geographer of high repute, in assessing the significance and importance of (to quote Professor L. Gallois) '*l'œuvre d'une école qu'on a bien voulu appeler l'école française de géographie.*'

G. H. J. DAYSH.

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THE BRITISH ISLES

WORLD POSITION AND STATUS

THE British Isles fill a very small space on the map of the northern hemisphere, where they are tucked away in the extreme northwest of the 'little protuberance of the Asiatic continent' which is known as Europe. Their 121,630 square miles represent but one-thirtieth part of Europe. Even if the vast expanse of Russia is left out of account, many European countries surpass them in area ; France, for instance, contains 213,000 square miles, Germany 181,466,¹ and Spain 200,000. The only countries which are comparable in size resemble them in their sea-girt and deeply indented character. These are Italy, with 120,000 square miles, and Norway, with 125,000.

But size would by itself be a very poor measure of their importance. Owing to the number, wealth, and quality of their inhabitants, they hold a foremost place among the regions of the Earth. Their population, which amounts to 50,200,000 souls, exceeds in number that of each of the countries with which they have been compared above, except Germany (69 million), being larger than that of France (42 million), Italy (43 million), Spain (24 million), and Norway (3 million). Further examination of demographic conditions shows that the British Isles are more densely peopled than any of the large countries of Europe, since they have 413 persons to the square mile, whilst Italy has only 358, Germany 379, France 197, Spain 120, and Norway 23. In an overpopulated Europe the British Isles form the most striking instance of a country in which the accumulated toil of past generations enables the present inhabitants to earn a livelihood.

If the causes which enable so vast a population to live in so small an area are examined, it is found that comparisons with European countries are inadequate ; that the importance of the British Isles must be assessed by world-wide comparisons, in which they some-

¹ This was the area of Germany in 1933. The population of this area was 69 millions according to the census of 1939.

times occupy the foremost place and are always in the front rank. Before the upheaval due to the war in 1939 their inhabitants extracted from the earth 20 per cent. of the world's coal and 9 per cent. of its iron ; they operated 28 per cent. of its cotton-spindles and owned 26 per cent. of the tonnage of the ships that sailed the seas.

This astonishing stream of industry and wealth did not spring from the British Isles alone, but came in innumerable trickles over the seas from the very ends of the earth. An immense empire, which covered one-quarter of the land surface of the globe and contained one-fourth of the world's population, had been grafted on to the little European archipelago. From it were obtained 72 per cent. of the world's gold, 48 per cent. of the tin ; 28 per cent. of the wheat crop ; and 77 per cent. of the wool clip. To-day, something like 200 million people speak English as their mother tongue. The island race, which in its own homeland has not eradicated the languages of the conquered peoples, has successfully transplanted its own tongue into every quarter of the globe. The part played by the nation in world affairs is greater than is warranted by the size of its European motherland and offers to the geographer the thrilling problem of a destiny which, though long confined to a remote corner of Europe, has now been extended to the uttermost ends of the earth.

The British Isles represent the least massive and compact—in fact, the most European—of the regions of Europe, which are all very rich in topographical forms and are greatly subdivided. In them the land is broken up into islands large and small. Around the two chief masses, Britain (88,753 square miles) and Ireland (32,408 square miles), cluster tiny groups like the Scillies, Hebrides, Orkneys, and Shetlands, whilst off the western shores scattered islets are found in thousands. The sea worms its way in bays and estuaries right into even the smallest of the islands, and the whole land area is little more than a collection of peninsulas and capes.

Throughout the islands the grip of the sea appears to draw men to a life on the waves ; though, in fact, it isolates them. The history of Britain begins with her isolation, for the sea was at first her enemy. ‘Owing to her insular position,’ says Vidal de la Blache, ‘Britain felt the effects of events in Europe later than did the peoples on the Continent. The influence of the Roman Empire and of Christianity reached her later than they did Gaul and in a different form. The Germanic invasions affected her later and more gradually than they did the districts bordering on the Rhine. She became a commercial power after the Hanseatic cities and an industrial centre after Flanders.’ The English were farmers and herdsmen long before they became sailors, and, even though they

have now broken through the sequestering waters, they still cling obstinately to the instinctive reactions of an insular mentality, such as their attachment to old institutions, their hesitation to imitate others, their preference for remaining detached when among strangers, their tendency to keep their race free from all admixture, their mania for avoiding ties with the Continent, and their mistrust of all foreign relations which cannot be broken off at any suitable moment. A tunnel under the Channel would, in the eyes of most Englishmen, be the end of their insular position. On the day when the first aeroplane from the Continent landed on British soil, the newspapers all raised the cry : ‘ Britain no more an island.’

The sea which isolates the British Isles did not change the state of affairs in the islands until it had been itself affected by the currents of maritime development. The island group kept its remote situation so long as the Mediterranean remained the centre of world-commerce ; nor did a change occur until commerce spread to the seas of northern Europe and extended from the Baltic through the Danish straits to the English Channel.

During the early centuries of the Middle Ages, sailors and merchants from the North left their *föhrden* and their *fjords*, ventured out into the open sea, and made for the shores of the mighty archipelago which closed their western horizon and of whose age-old reputation for wealth in precious metals and pastures they had heard. That was how the still passive islands entered the economic sphere of the sea-faring peoples of the Continent. Not until then could the English conceive their future on the ocean. ‘ Britain,’ says Vidal de la Blache, ‘ owed to the successive immigrations of peoples who were already hardened to the discipline of the sea an increasing store of nautical experience which the primitive inhabitants of their country seem to have lacked.’

It was through contact with the spirit of adventure brought by these ‘ Easterlings ’ that Britain’s advantages in shape and position bore fruit. The North Sea, though land-girt, is more open, less continental, and more of a fringing sea than the Baltic or the Mediterranean. It ends in straits, but not in blind alleys. It communicates through the Skagerrak with the Baltic and the East ; and through the Straits of Dover with the warmer and sunnier coasts of Aquitania and the Iberian Peninsula. Its waters penetrate in wide estuaries right into the heart of the land. The mouths of the Rhine and Schelde, which act as gateways into Central Europe, face the Thames ; the estuary of Southampton Water lies over against the Seine, which opens up the way along an ancient route to the Mediterranean. The very details of the opposite coasts correspond to each other, and English seamen, on crossing the

'Narrow Seas' and landing, find scenes and havens resembling those of their native land.

The influence of this land-girt sea has been all the stronger since the relief of the British Isles causes them to look towards the North Sea. The island group comprises two naturally different regions. On the west, facing the Atlantic, is an upland region which includes Scotland, Wales, and Ireland. It is remote, hilly, sometimes wild, and always difficult of access. Until about the 17th century, London communicated less easily with these isolated and refractory uplands than with the districts bordering on the Seine, Schelde, and Rhine. On the east long rivers flow in wide valleys through a lowland region which slopes down to the shores of the North Sea ; and on the other side of this Sea extends a corresponding region of lowland which is accessible, habitable, and densely peopled, and which very early reached the highest degree of commercial and industrial development. No other maritime basin has seen the rise of so many large and flourishing ports.

Sometimes the opposite coasts are so close as to be visible from each other. In clear weather the white cliffs of the French coast can be seen with the naked eye from Dover across the intervening twenty-one miles of the Straits. Now, on the shores of the Continent opposite the British Isles the frontiers of two historic races touch, namely those of the Latin and the Germanic peoples, whose great civilisations have fused in the crucible of Britain. Latin culture influenced religion and politics ; Germanic culture bestowed its language and taught the islanders the crafts of the sea.

The horizon of Britain was long confined to the seas and lands of Europe ; but after the great discoveries of the 15th and 16th centuries its expansion knew no bounds. The great geographical revolution which followed the discoveries affected Britain more deeply than any other country in Western Europe. Up to this time she had been remote, an *Ultima Thule*, hidden away at the western extremity of the known world, far from the centres of Mediterranean civilisation. Farther west lay the mysterious expanses of the wide, empty ocean. Once the New World had been made known by the great discoveries, the British Isles ceased to be on the fringes of the Earth : with Spain, Portugal, France, and the Low Countries they suddenly found themselves among the countries situated on the North Atlantic, just when that ocean had become a thoroughfare for world traffic. The British Isles occupy a unique position on the eastern shores of the North Atlantic, for they contain the westernmost point of Europe, near the island of Valentia off the Irish coast, from which the first telegraph cable between Europe and America was laid in 1865. An outpost of

Europe, surrounded by water, and farther north than the Iberian Peninsula, they lie across the path of the southwesterly winds on the route of sailing-ships from America in a latitude in which the winters are too mild to freeze over the harbours.

The experience in foreign commerce gained in the North Sea from the Hanseatic traders found a marvellous field of action in the new Western World. Every adventurous spirit in England turned towards the prizes which glittered in this direction. Traders and mariners set off to exploit the Indies, and English settlements were established on the coasts and at the gateways of the new countries of America, Africa, and Asia. Exotic merchandise began to reach the warehouses in London, Bristol, Liverpool, and Glasgow, and soon world-commerce became the prime motive of the whole British economic system. Capital derived from the plantations, from the trade in negroes, and from the profits on shipping furnished the means to build the factories of the Industrial Revolution. To sell the vast quantity of goods turned out by these factories, new outlets had to be conquered overseas ; and to supply the factories, new sources of raw material had to be won. The countryside of Britain no longer sufficed to feed the workers, deserted as it was by its agricultural population ; so food had to be brought from abroad. The whole economic system of the country—the food for the workers, raw material, and manufactured goods—became a function of foreign commerce. Gradually, the life of the country became indissolubly bound up with world-relations.

A paradoxical nation, the most purely European in existence, was now born in Great Britain. Its daily life depends on the regularity and prosperity of a wonderful system of foreign commerce which rests on the possibility of the English exchanging the produce of their own labour for foodstuffs and raw materials. By the ingenuity and power of this system, which represents the quintessence of European progress, Great Britain guided the economic tendencies of the world during the 19th century, carrying in her ships the produce of distant lands, attracting to her ports the market for exotic commodities, accumulating the profits of commerce in her banks so as to employ them promptly in the exploitation of the new countries, producing manufactured goods in her factories in order to sell them to poorly equipped peoples, furnishing empty territories with the colonists which were needed for their settlement—in short, distributing over the whole world her precious stocks of money, toil, and manhood.

This position of superiority undoubtedly shows signs of decline—certainly not because the vigorous strength of the nation has seriously diminished, but because other nations have increased

theirs. For one or two generations past, the development of non-European peoples has greatly affected the European economic system and especially that of Great Britain, since she is the most typical representative of Western civilisation. The hegemony of Europe is on the decline. The spirit of initiative and enterprise is awakening and rising up in all the nations of America and Asia. In all the fields which were once reserved for the older peoples of Europe, namely industrial production, shipping, international trade, and the financing of enterprises, they are boldly and successfully pushing their way. Outside Europe great centres of industry have arisen in the United States, India, and Japan. Some of the markets for necessary commodities, like wheat, sugar, cotton, meat, and petrol, are no longer under European control. Other flags are being flown in the Suez and Panama Canals. In their functions as international financiers the London bankers are being rivalled by those of New York, and the dollar reigns supreme in lands where European currency once held sway.

Man's horizon has widened. Long restricted to the Mediterranean, it did not even include Britain. Its sudden expansion across the Atlantic placed the little group of islands in the centre of the civilised world. Now the world's centre of gravity is once again moving westwards. The stream of ocean traffic, which for long flowed towards Western Europe, is being partly reversed through the establishment of a centre of production, distribution, and finance in the United States. The Pacific, which for ages was regarded as an ocean of remote antipodean lands, is becoming one of the world's thoroughfares ; and though hitherto it has been out of the stream of international traffic, it is now playing the part of an independent centre. Its two shores, which during the past century belonged to two different worlds, that of the East and that of the West, are now turning towards each other and are becoming the frontages of a new Mediterranean. Meanwhile, the British Isles and other countries in Western Europe are finding themselves out of the orbit of these new constellations.

PART I

GENERAL SURVEY

CHAPTER I

SHAPE, STRUCTURE, AND RELIEF

NORTHWESTERN Europe ends in a series of peninsulas and island groups which are separated from each other by shallow seas. Beyond the Scandinavian, Danish, and Breton peninsulas, the continent seems to crumble into fragments, whilst to the north of the British Isles the Orkneys, Shetlands, and Færöes rise from the waves like the piers of a broken bridge which must formerly have led to Iceland. On the other side of the Atlantic also the same arrangement of islands and peninsulas is found in Hudson Bay, Greenland, the Arctic Archipelago, and Newfoundland. Between all these fragments of land separated by arms of the sea there are certain common features, deep-seated affinities, and family likenesses which are also recognisable in the British Isles.

1. RELATION TO NORTHWESTERN EUROPE

GEOLOGICAL AFFINITIES. The two sister islands of Britain and Ireland show many points of similarity. The countryside of Donegal in northwestern Ireland calls to mind that of the Highlands of Scotland. In both regions there are the same crystalline rocks, the same wild, rough surface strewn with little lakes and pierced by long inlets; the same *roches moutonnées*, the same mosses and peat-bogs. The Wicklow Hills in Ireland face the Welsh mountains, whose schists and quartzites belong to the same Cambrian system. On both sides of the water there are large areas of trap, hardened ash, and agglomerate, which were emitted at the same period by ancient volcanoes. During the course of their geological history the two islands have shared in a whole series of events. Hence the resemblance between the chalk cliffs of northeastern Ireland and those of the English Channel. In the more recent Tertiary period mighty volcanic eruptions occurred in northern Ireland and western Scotland, when lava-flows, which were more than 3000 feet thick, formed large basaltic plateaus that were formerly continuous from one island to the other; but, being fractured and shattered, have been partly submerged beneath the sea. What remains of them, however, makes it possible to reconstruct their former extent. They may be traced from Antrim, where they appear in

the columnar structure and pavement-like surface of the Giants' Causeway, to the islands of Mull and Skye and northwards to the promontories of Morven and Ardnamurchan on the mainland of Scotland (see Fig. 1 and Plates III and IV A).

Beyond the remotest capes of Britain, right into the waters of the Arctic, the same likenesses recur, in spite of the enormous intervening stretches of sea. In the Færöes the same steep cliffs capped with beds of lava rise like giant ramparts, and similar formations are to be observed in Jan Mayen, Iceland, and the west coast of Greenland. Between Scotland and Norway there are decided affinities, for the Hebrides resemble the Lofoten Islands, the flat-topped mountains of the Highlands call to mind the wide areas of the *fjelde*, and the gash-like lochs of Scotland match the winding fjords of Norway. In both countries there are the same gneiss and Old Red Sandstone.

Farther south, the similarities become striking on the coasts of the English Channel. The countryside of Brittany reproduces the familiar scenes of Cornwall, with its granites and schists, its swarms of islets and reefs, its bold promontories undercut by the waves, its treeless, windswept plateaus, its abundance of metallic veins, and its ancient tin mines. At the Straits of Dover it is no longer a question of likeness, but rather of continuity, for on both sides of the Straits there are the same flint-embedded chalk cliffs, which bear unanswerable testimony to the existence of an ancient land-bridge.

STRUCTURAL AFFINITIES. The countries of northwestern Europe exhibit other and more deep-seated affinities that are due, not to similarities of relief and geological composition, but to a common structural design which runs through these fragmentary masses, giving them a similar grain. From very remote geological times orogenic movements have again and again built up mountain ranges, and although the mountains themselves have been destroyed by erosional forces, their roots still remain as the foundation of the region, and their original pattern still governs topographical relief and form.

The most ancient of these folds is found in the belt of Archæan rocks which form the Outer Hebrides and the northwestern coast of the Highlands of Scotland. In Canada and Norway Archæan rocks show the same arrangement and the same mutual relations. Identical types of iron ore have been recognised in Scandinavia, in the Adirondack Hills in New York State, and in Carn Chuinneag in Ross. It is therefore justifiable to accept the existence of an ancient mountain range, composed of folded pre-Cambrian sediments, which once stretched from America to Europe across an area now occupied by the North Atlantic. It has been named the

Huronian Range, because the folds are particularly clearly marked in southern Canada in the former territory of the Huron tribe.

From the North Cape to Donegal there rise at intervals along the Atlantic coast fragments of an ancient, though more recent, range

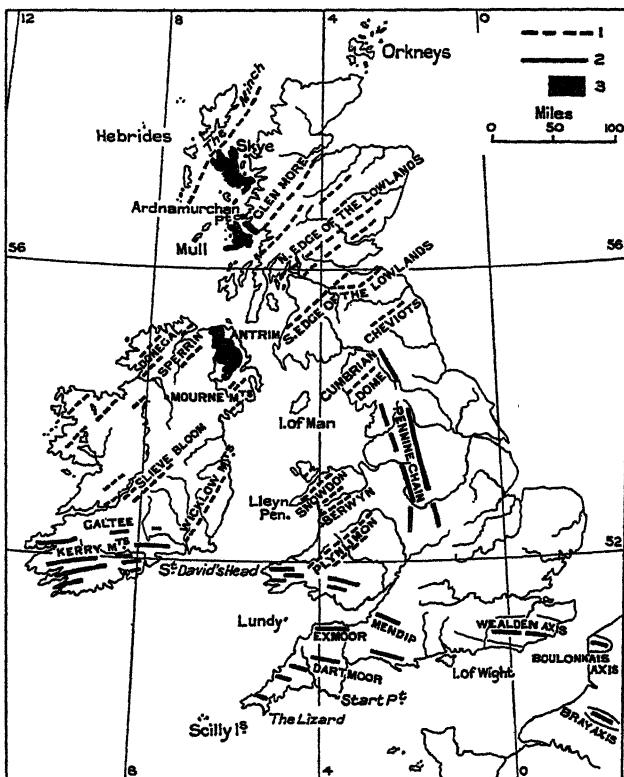


FIG. 1. Influence of Structure on Relief. The trend lines show up the difference between areas affected by the Caledonian and Hercynian systems.

1. Direction of the Caledonian folds.
2. Direction of the Hercynian folds.
3. Tertiary basaltic flows.

known as the Caledonian, which was upfolded in the Silurian period. Its essential features have been found also in Greenland and Spitsbergen. In western Norway its east-and-west folds impart their direction to the grain of the land and to the fjords, before disappearing under the waters of the Atlantic. But they reappear in Scotland, and it may be said that the whole of that country is composed of the stumps of this huge range (see Fig. 1). This great

folded range affords a classic instance of striking displacements in the north of Scotland. Ancient masses of rock which have been torn from their foundations, swept forward, and pressed like waves on more recent formations, have been thrust onwards for a distance of some twelve miles from southeast to northwest. The belt of overthrusting can be traced for ninety miles from Loch Erriboll in the extreme northwest of Scotland to Loch Carron opposite the Isle of Skye. Behind this belt a northeast-southwest direction prevails in the grain of the land throughout Scotland, betraying the course of the Caledonian folds and their influence on topographical evolution. The Glen More trench, the central rift valley, the Southern Uplands, various geological outcrops, promontories which run far out to sea, and estuaries which penetrate deeply into the land, all bear the impress of this directional control. Maps show its existence also in Anglesey, the Lleyn Peninsula,

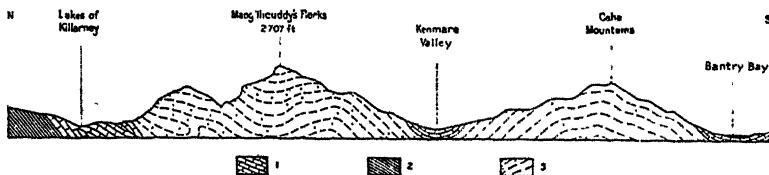


FIG. 2. Section across Southern Ireland from the Lakes of Killarney to Bantry Bay. (After Hull.) Note that the valleys correspond to down-folds and the mountains to upfolds.

1. Carboniferous limestone and shale.
2. Voredale shales.
3. Old Red Sandstone.

and the Berwyn and Plynlimon Mountains in North Wales. Across St. George's Channel the frequency of the northeast-southwest axis in the grain of the land shows that Ireland belongs to the same structural system. The direction of the Caledonian folds is seen in the parallel ridges and valleys of Donegal, in the Belfast depression which looks like an extension of the Midland Valley of Scotland, in the isolated Slieve Bloom range in central Ireland, and in the granite masses and bands of schist in the Wicklow Hills and Wexford which are opposite the similarly aligned mountains of Wales. So, from the polar regions to Ireland and Wales, a deep-seated unity of structure is evident throughout, both in the foundational rocks and in the surface features.

At the end of the Primary another mountain range was uplifted along a line farther south than the other two. This was the Hercynian Chain. Like the others, it has now been destroyed by dislocation and erosion, but it is recognisable in the fragments which occur in Silesia, Bohemia, the Harz Mountains, the Black Forest,

the Vosges, the Ardennes, Brittany, southern England, and Ireland. The whole of southern Ireland owes to it the pattern of its relief. The Old Red Sandstone and carboniferous limestone are laid down in long parallel, east-and-west folds. The upfolds, or anticlines, jut out into the sea to form long promontories ; the downfolds, or synclines, are drowned by the sea and form bays between the promontories. The whole topography of southern Ireland is the result of the arrangement of the rock in parallel folds (see Figs. 1 and 2).

On the eastern side of St. George's Channel the same structure recurs in the three peninsulas of South Wales, in the Mendips, which are a hump of carboniferous limestone rising to the south of the Severn estuary, and in Steep Holme, a rocky islet in the very middle of the estuary. The same topographical grain is found in Exmoor in North Devon and in Lundy, which continues it into the sea. Farther south, it also recurs in the granite bosses which run in a series from Dartmoor to the Scilly Isles. The little Archæan belts found in the Lizard and Start Point indicate that this area is also in the sphere of the Hercynian Range, which occurs once again on the other side of the English Channel in Brittany. Hence, St. George's Channel, the Bristol Channel, and the English Channel break into three fragments the widespread range of east-and-west folds whose hills are met with at intervals from southern Ireland to la Vendée. Owing to subsidence and fracture, the ancient range disappears towards the east under the more recent sediments of the London Basin, Belgium, and the Paris Basin ; but only to reappear in the uplands of the Ardennes and the Vosges.

Folds of the same age have uplifted the Pennine Range in the very heart of England, but their orientation is north-and-south, not east-and-west. The axis of this range runs therefore at right angles to the other Hercynian folds. The deflection, which has, so to speak, made the backbone of England, is explained by the meeting of the most northerly folds of the Hercynian system in the west of England with the resistant masses of the Caledonian Range in Wales and Cumberland, and the moulding of the folds against the north-and-south lines of those masses.

Even when they have disappeared under other strata, the folds of the Hercynian Range still manifest their subterranean continuity. In the south of England and in the north of France the younger beds which were laid down on the surface of the Hercynian continent evince wrinkleings whose axes follow the same direction as the ancient folds. The dome of the Weald and that of the Isle of Wight conform to the direction of the Hercynian folds, so that the topography of

the whole of southeastern England, with its long chalk escarpments in the Downs and the symmetrical form of the Isle of Wight, faithfully reproduce at the surface the deep-seated influence of the buried structure. In the north of France the domes of the Boulonnais and Bray point to the same influence and demonstrate the unity of plan existing in the whole of this part of England and France.

THE COAL AND METALLIFEROUS BELT. Besides its structural unity which forms the basis of the whole of its relief, the Hercynian system has a further importance in Geography, as it is the coal- and metal-bearing zone throughout Western Europe. During the whole of the latter part of the Carboniferous, the streams which flowed down from the lofty mountains in the south deposited vast accumulations of sediment and vegetable matter in a long series of coastal lagoons and marshes which stretched from Silesia to Britain and seemingly across the Atlantic to North America. These basins now form, first, the coal seams of Scotland, with their bituminous beds which are being exploited to-day for mineral oil, and with their deposits of iron ore interposed between the carboniferous strata. Secondly, they form the English coalfields of Cumberland, Durham, Northumberland, Lancashire, Yorkshire, Staffordshire, and Wales, which have been several times submerged beneath the sea and which contain beds of carbonate of iron. Thirdly, they form the coalfields of France, Belgium, Westphalia, Saxony, and Silesia. There is, so to speak, an enormous belt of coal-bearing rocks passing right across Europe. Subsidence, fracture, crumbling, and overthrusting have broken its continuity. Sometimes it disappears at the bottom of wide basins under enormous thicknesses of sediment ; at other times it is interrupted as a result of violent dislocation, as has happened in the Rhine valley. But, even though the coal belt has been fractured, broken to pieces, and rifted, its outcrops stand out as one of the peculiarities of the Hercynian system.

A close relation is also noticed between the Hercynian folds and metalliferous deposits. Like all periods of dislocation, the Hercynian was marked by intrusions of igneous rocks and eruptive lodes. In Ireland the metalliferous veins which traverse the Primary rocks are concentrated in dislocated regions, whilst the Central Plain, which was hardly touched by folding, is characterised by an infrequency of metalliferous deposits. In fact, in Western as in Central Europe the fragments of the Hercynian system are remarkable centres of metallogenic phenomena. Lodes of tin, copper, silver lead, and zinc abound in them. The zinc beds in the Vieille Montagne to the east of Liége have been exploited for centuries ;



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VIEW OF THE CAIRNGORMS

Castle Hill appears on the skyline to the left, and Carn Eidgeon on the right. The heights reach the same general level, and the outlines are smooth and regular. The gap in the centre is a glacial valley leading from Strathspey to the Dee Valley. Morainic mounds occur at its nearer end. In the foreground is the Forest of Rothiemurchus.

[Crown Copyright.]

VIEW LOOKING SOUTH FROM THE TOP OF THE CAIRNGORMS
The heights are plateau-like and cut by deep glacial valleys. In the foreground is Loch Etchachan, which drains into the Dee, and behind it is Loch Avon, which drains into the Spey. The general smoothness of the outlines is characteristic.



tin has made Cornwall famous since ancient times ; lead and zinc are found throughout the length of the Pennines ; copper occurs in the south of Ireland and in Devon. This mineral wealth characterises the belt of uplands which stretches from Saxony and the Harz Mountains through the Liége district to Wales. Man has visited these areas from very early times in search of metals, and the zone occupies a peculiar position in the economic system of northwestern Europe.

2. STRUCTURAL SUBDIVISION OF THE ISLANDS

Since the close of the Primary, northwestern Europe has seen no further uplifting of mountain ranges, but has merely felt the distant effects of the orogenetic movements which gave rise to the Alps. Its most elevated regions bear the marks of great antiquity and have lost their original height and continuity under the action of the forces of erosion. Some of the fragments of the ancient mountain ranges have sunk beneath the sea ; others after having been submerged have reappeared above sea level and are overlaid with thick beds of younger sediments ; others again have been more stable, more resistant to subsidence, and seem to have remained above the sea for long ages.

The type of relief which results from this places Western Europe in contrast with Eastern and Mediterranean Europe. Since in Russia the rocks have undergone no folding subsequent to the Palaeozoic, the Primary beds, which in the West were uplifted into mountain ranges during the Hercynian, have remained horizontal and preserve the appearance of a vast platform. In the Mediterranean region the formation of the Alpine folds is of very recent date ; hence, they spread out in mighty arcs and rise in gigantic masses. In Western Europe, on the other hand, there is neither the age-long stability of Russia nor the structural youth of the Mediterranean, but rather a peculiar kind of build which is essentially due to vertical displacements. From this there results a division of the area into uplifted blocks and basins of subsidence, which gives a kind of cell-like arrangement of hill masses and depressions, of upland and lowland.

UPLAND AND LOWLAND. Structural subdivision of the relief as a whole is marked by three main, fundamental zones. In the west a belt of uplands, comprising Scandinavia, Scotland, Ireland, Wales, Devon and Cornwall, and Brittany, borders on the Atlantic. Farther east, and in rear of the uplands, lies a zone of depressions occupying the lowlands of England, Belgium and the Netherlands, the Paris Basin, and the North Sea. Still farther east, and behind these

basins, rises another series of uplands consisting of the Central Highlands of France, the Vosges, and the Ardennes.

The belt of depressions and basins appears to be a very ancient element in the structural scheme. Its drainage system has a strength and independence which postulates for its explanation long ages of adaptation and evolution. Whilst from Norway to Brittany the Atlantic slopes contain few streams of any importance, mighty fluvial arteries, like the Elbe, Weser, Rhine, Maas, Schelde, Seine, and Thames, flow into the shallow waters which have drowned the lowest portion of the depressions.

The uplands of the Atlantic seaboard are not continuous, but are interrupted by broad arms of the sea which run transversely to the

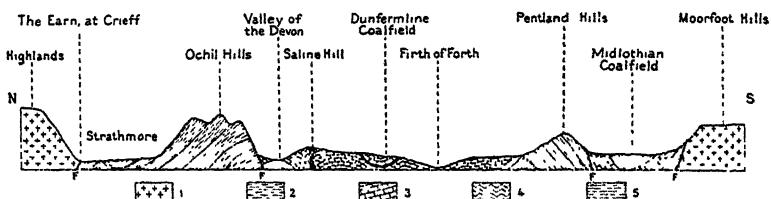


FIG. 3. Section Northwest to Southeast across the Rift which forms the Midland Valley of Scotland. (After Geikie.) On account of its broken relief caused by the intrusion of hard rocks, the Midland Valley cannot be properly termed a plain.

1. Crystalline rocks of the Highlands and Southern Uplands.
2. Old Red Sandstone, with intrusions of volcanic rocks.
3. Carboniferous Limestone, with intrusions of volcanic rocks, and Millstone Grit.
4. Silurian rocks.
5. Coal Measures.

mountain ranges and impose on the land a new pattern independent of the ancient controlling lines of structure. The entrance into the North Sea between Norway and Scotland has been caused by a breach in the Caledonian Range, and so has the North Channel which separates Scotland and Ireland; whilst St. George's Channel, the Bristol Channel, and the English Channel have cut across the axes of the Hercynian Range. On the whole Atlantic seaboard the coastlines run transversely to the folds, and the sea cuts across the mountain ranges. This is a repetition of the structure which characterises the coasts of Nova Scotia and Newfoundland on the other side of the Atlantic. The transverse arms of the sea appear to be very ancient geographical features. As early as the Jurassic there is evidence of a submarine depression which followed the present coast of Britain, passing across Ulster and including the district around Chester. Later, this was overlaid with chalk deposits. There are also proofs of the antiquity of the English Channel, at

least in its western end ; and it is thought to occupy a depression which existed as a rift valley during the Secondary.

Considered separately, each upland area forms a block bounded on all sides by faults. Scotland consists of several divisions of this kind. Glen More, which divides the Highlands into two parts, assumes a most significant rectilinear form ; the Midland Valley occupies a rift between two lines of faults (see Fig. 3) ; whilst the Southern Uplands are merely a horst standing between two regions of subsidence. The marginal lines of fracture have caused subsidence ‘which may attain in a single fault,’ says Suess, ‘the mean depth of the Atlantic Ocean, and yet this fault manifests itself so little in the landscape that a mere thread of water such as the Nith pursues its winding course undisturbed across it.’¹ Ireland consists of two series of uplands, one in the north and the other in the south, separated by a central plain. Wales rises from the midst of lowlands which are marked by plains, estuaries, and bights. The same kind of structure, which is governed by faulting and subsidence, is also found in the Central Highlands of France, Brittany, the Vosges, and the Ardennes, as well as in Iceland, Spitsbergen, and Fridtjof Nansen Land. The tectonic movements which have caused these subsidences have indeed not yet ceased, and it can be proved by the distribution of earthquake-frequency that none of these areas has yet attained stability. Nearly all the earthquakes that occur in Britain have some relation to geological faults, which indicates that the faulting has not yet come to an end. In Scotland, where there is great frequency of seismic disturbance, earthquakes are recorded chiefly along the gigantic rift of Glen More.

THE NORTH SEA BASIN. The North Sea occupies the northern portion of a wide depression which is bounded on the west by the uplands of Britain and Armorica, on the south by the Central Highlands of France, and on the east by the uplands of the Rhine and Mosel. Its northern boundary has foundered beneath the sea. The existence of this wide area of subsidence goes back very far into the past. Even at the beginning of the Secondary a rough outline of the present North Sea was already perceptible. During that period and the early Tertiary, geologists locate on the existing site of the Sea a submerged area enclosed by highlands, and Haug gives the name ‘German Depression’ to this long-standing feature of northwestern Europe.

The changes which finally determined the shape and character of the basin began about the middle of the Tertiary, when a period of continuous subsidence and intense sedimentation set in, which

¹ *The Face of the Earth*, Vol. II, Ch. II, p. 81; trans. by Hertha H. B. Sollas.

lasted until the dawn of the present geological era. From Oligocene and Miocene times the bottom of the basin gradually subsided, owing perhaps to the influence of the distant Alpine movements. At once the rivers, and especially the Rhine and the Maas, made unceasing efforts to fill up the depression, and the southern shores of the North Sea became what they were thenceforth to be, namely a region of large deltas. A desperate struggle began between subsidence and sedimentation, and this has continued right up to our own times with alternate success for land and sea. But on the whole, a kind of balance has been maintained between the two elements, for remains of animal life in the deposits of the late Tertiary, which have been revealed by soundings even at great depths, always evince the character proper to coasts and shallow waters. Indeed, it would appear that, whatever the total amount of subsidence, the depth of the sea at this period never exceeded 200 or 250 feet over the present site of the Netherlands.

In the course of this long struggle between land and sea there was a moment about the end of the Pliocene when the balance of forces was not the same as they are at present, for, whilst the land was gaining in the southwest, the sea was encroaching in the northeast. In the southwest a single continuous plain connected the districts around the existing mouths of the Rhine, the North Sea, and the eastern portions of Essex, Suffolk, and Norfolk, as is proved by the Pliocene beds of crag observed in these three counties. The North Sea coastline oscillated across these counties, and the fluvio-marine character of certain strata (*e.g.*, Norwich crag) admits of their having been deposited by the Rhine, whose gently flowing distributaries encroached at that time on British soil. Other deposits of the same fluvio-marine nature indicate the persistence of delta formation in Norfolk. The strata known as Forest bâds, which are found near Cromer and consist of layers of sand, gravel, clay, lignite, trunks of trees, and remains of mammals and molluscs, give further proof, by the nature of their bedding and the character of certain pebbles found in them, of the existence of a branch of the Rhine which formerly meandered across this lowlying area. At more or less the same moment, in contrast with the low-lands of East Anglia and of the southern portion of the North Sea, there stretched across the modern Dutch provinces of Zeeland and Holland a submerged basin in which there accumulated vast masses of sediment brought down by other branches of the Maas and Rhine. These now form thick layers of sand and gravel which are known in Belgium by the names of Casterlian, Scaldisian, and Poederlian, and in the Netherlands by the name of Amstelian. As the bottom of the basin subsided, all these deposits sank, almost on being

PLATE III



[Photo: Lawrence.

A. THE WHITE ROCKS NEAR PORTRUSH IN NORTHERN IRELAND
The sea-cliff exposes a section showing the basalt flow of Antrim, which lies
in a stratum of chalk.



[Photo: Lawrence.

B. CLIFFS OF VOLCANIC ROCKS NEAR THE GIANT'S CAUSEWAY IN THE
NORTH OF IRELAND

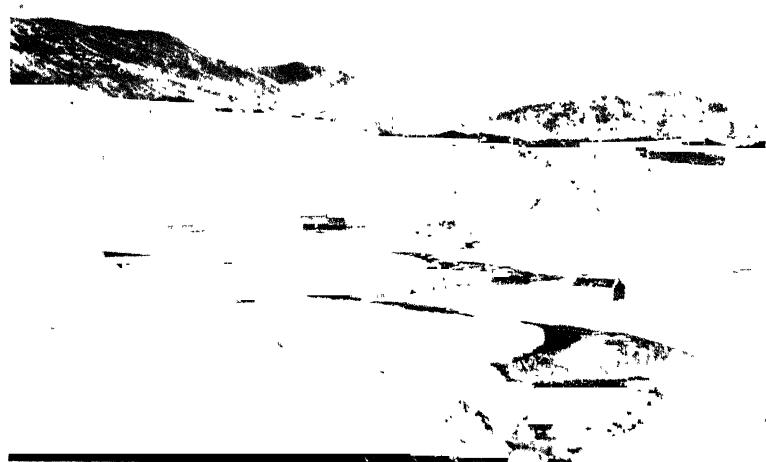
PLATE IV



[Photo: Lawrence.

A. THE GIANT'S CAUSEWAY, ANTRIM

The formation of the basalt in hexagonal columns is clearly revealed by sea action.



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B. A TERMINAL MORaine IN GLEN TORRIDON

The rough mammillated surface in the middle-ground is characteristic. Within the circle formed by moraines the ground is swampy or actually covered with water.

formed. Their maximum thickness at Amsterdam is something like 1500 feet, and at Utrecht nearly 1000 feet.

At one moment towards the end of the Pliocene and the beginning of the Pleistocene the land seemed victorious. There began an interval of rest in the land areas then existing in what are now the North Sea and the Netherlands, and the migration of animals took place freely between the Continent and Britain. But the balance was again upset, and subsidence began once more, threatening the newly formed land with its irresistible and inexorable movement. The sea encroached again, advancing its shorelines southwards or withdrawing them towards the north, according to the local pulsations of the underlying crust. At the time of the retreat of the ice-cap, the sea covered the district of Amersfoort to the south of the Zuider Zee. But this was not the last encroachment of the sea on the low-lying parts of Belgium and Holland, for human history, which was then in its early years, records numerous local incursions, including one in the 4th century A.D. which flooded the maritime plain of Flanders and left behind it the two gulfs of the Yser and the Zwijn when it retreated in the 9th century, and also one in the 12th century which formed the Zuider Zee. Hence, the Dutch may well wonder whether this widespread subsidence, which has occurred at every phase in the evolution of their country, is not an inevitable characteristic of its structure. There is no reason why the faulting deep down in the crust, whose movements have controlled the subsidences of the surface in past ages, should not continue to operate in the future.

THE DISLOCATION OF THE ATLANTIC CONTINENT. When did the Atlantic continent break up? When did the British Isles lose contact with the Færöes and Iceland? When were they detached from the Continent of Europe?

The separation did not take the form of a cataclysm, but spread itself over a long period. It began with the severance of communication between Europe and America, and ended with the formation of the Straits of Dover at an age not far removed from our own times.

The Atlantic continent certainly still existed well into the Tertiary, since fossil plants of this period, which are found under the basaltic rocks in Ireland, the Hebrides, Færöes, Iceland, and Greenland, exhibit characteristic likenesses which point to their having existed in a single continuous land mass. It is even possible to fix parts of the outline of the continent, thanks to the littoral deposits in its marginal seas. These deposits are found in Spitsbergen and along the 75th degree of latitude in Greenland, and, to turn in the opposite direction, as far south as the Azores. The

dislocations which began the disruption of the continent may be dated about the end of the period of fissure eruptions whose basaltic lava-flows may be seen in the arc of islands between Ireland and Greenland. At the same time subsidence produced the deep submarine trenches which now separate the fragments of the Atlantic

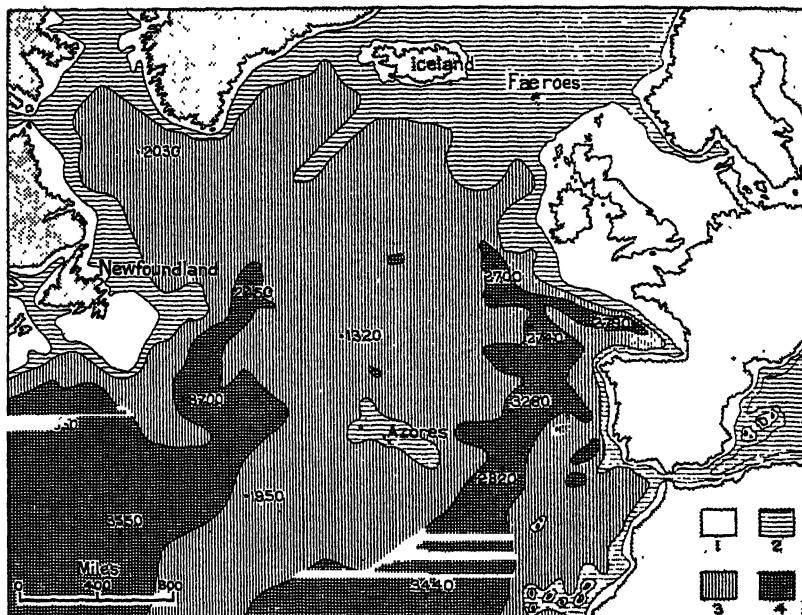


FIG. 4. Relief of the Floor of the North Atlantic Ocean. The Wyville-Thomson Ridge and the continental shelf on which the British Isles stand are clearly shown.

1. Sea-level to 100 fathoms.
2. 100-1000 fathoms.
3. 1000-2500 fathoms.
4. Below 2500 fathoms.

continent; and the North Atlantic Ocean assumed its present form (see Fig. 4).

The most remarkable feature in the submarine topography of this Ocean is the existence of two large and almost symmetrical troughs, the deeper of which follows the coast of North America and reaches a depth of nearly 4000 fathoms to the southeast of Bermuda, whilst the other, which is shallower, narrower, and less regular, runs along the coasts of Europe and Africa, giving soundings of 2780 fathoms in the Bay of Biscay and 3280 fathoms to the northeast of the Azores. Between the two troughs there extends

from Iceland to the Equator a great central plateau which perhaps represents the early stages of a range of mountains in process of being upfolded along a line parallel to the cordilleras of America and reproducing the sinuosities of the Atlantic coasts.

But long after this a land-bridge persisted between Europe and America. Strong evidence of this connexion is supplied by the fauna. A freshwater pearl-mussel (*Margaritana margaritifer*) is found in the United States, Ireland, the west of Britain, and in Scandinavia. Even more significant is the distribution of a snail (*Helix hortensis*) which occurs only in Scandinavia, the British Isles, the Shetlands, the Færöes, Iceland, southern Greenland, Labrador, Newfoundland, Prince Edward Island, and Maine. This distribution cannot be attributed to man's influence in recent times, for shells of the *Helix hortensis* have been found in Quaternary deposits. Bones of the Great Auk (*Alca impennis*), a bird which still existed in Scotland and Ireland a century ago, have been discovered in Scandinavia, Iceland, Greenland, and Funk Island off Newfoundland.

The land-bridge is now interrupted by channels and straits which open a way from the Atlantic Ocean into the Arctic Sea. These are Davis Strait between Greenland and Labrador; Denmark Strait, whose 130 miles of breadth separates Greenland from Iceland; and another still wider strait, 460 miles across, between Iceland and Scotland, which is divided into several channels by the Færöes and Shetlands. A single large submarine ridge acts as the foundation of all these isolated islands, and, if the sea level were lowered by 500 fathoms, America would be joined to Europe through Greenland and Iceland. The breadth of the isthmuses thus raised above the sea would not exceed 75 miles between Greenland and Iceland, 90 miles between Iceland and the Færöes, and 12 miles between the Færöes and Scotland. In the last-named channel the separation of the Atlantic and Arctic basins is caused by a veritable submarine wall, known as the Wyville-Thomson Ridge.

On the floor of this narrow part of the Atlantic which is confined between relatively close land areas, terrigenous deposits are brought up by the lead, proving that recent events in the history of the continents have left their traces on the sea bottom. In July, 1911, off the southwest of Ireland, the trawls of the *Michael Sars* brought up from a depth of 1150 fathoms rocks of Scottish and Irish origin. More than half the specimens bore the marks of striation, showing that they were material from a ground moraine and that they had been carried away by the icebergs which had calved off from glaciers in the British Isles. Farther west, between Ireland and Newfoundland, on the track of the transatlantic telegraph cables along the

50th degree of latitude, the depth is as great as 1500 or even 2500 fathoms on the submarine plateau. There only deep-sea deposits are found. They consist of globigerina ooze which covers the surface of Telegraph Plateau and into which the cables slowly sink.

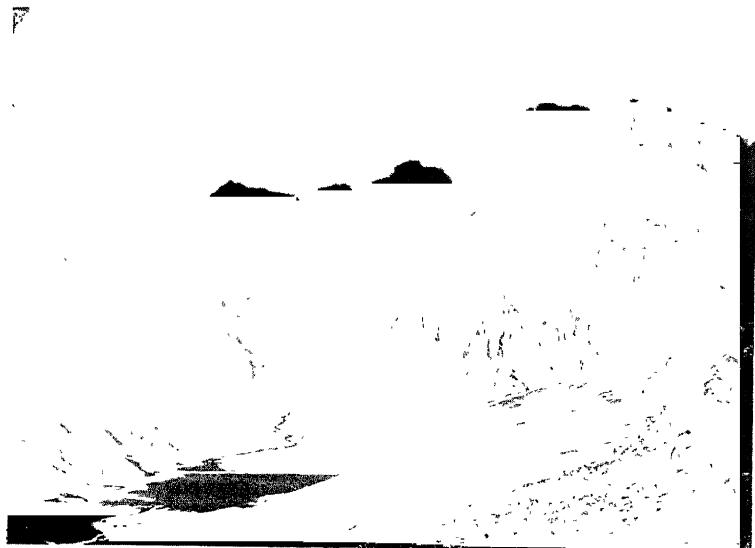
There is much evidence in support of the assertion that the topography of the floor of the Atlantic dates from a fairly recent period and that the disruption of the Atlantic continent does not go back to a very distant past. Nansen considered the rupture of the land-bridge between Greenland and Scotland to be subsequent to the Ice Ages.

The great subsidences clearly delimited the frontier between the oceanic and continental areas. This frontier does not lie, as many might imagine, along the line of contact between sea and land, but below sea level where the shallow waters meet the deep. In this sense, the North Sea and the English Channel with their shallow waters should be regarded as being within the continental sphere. An uplift of 30 fathoms would partly eliminate them and would connect a large portion of the coast of England with those of France, Belgium, the Netherlands, and Denmark. An uplift of 100 fathoms would completely unite the British Isles with the Continent and would join Ireland to Britain.

THE CONTINENTAL SHELF AND THE FORMATION OF THE STRAITS OF DOVER. The whole of the British Isles rests on a broad platform. This continental shelf must be thought of as a drowned plain whose relief is connected, closely and without any noticeable line of junction, with the land around it. Hence, the real boundary of the continent must be sought to the west of it. The sea bottom slopes gradually down in that direction to a depth of 100 fathoms, but beyond this it falls away steeply to a depth of 500, 1000, or even 1500 fathoms. Off the coast of Iceland the slope, which is gradual down to 500 fathoms, suddenly plunges down to 1700 fathoms in a horizontal distance of 12 miles, in a gradient of nearly 1 in 10. This veritable escarpment crosses the entrance of the North Sea on the far side of the Shetlands and goes round outside the Hebrides, Ireland, and Brittany into the Bay of Biscay (see Fig. 4). Thus, the shelf on which the British Isles stand, and the thin film of sea-water which covers it, both form part of the Continent.

A mere glance is enough to show that this submarine platform exhibits the character of a recently drowned land surface. It is trenched by the kind of valleys that are formed by fluvial erosion. One of these, which lies to the northwest of Cotentin and is marked on the chart as Hurd Deep, is more than fifty miles long by about four miles wide and is incised to a depth of something like 40 feet below the general level of the platform. Another submarine valley,

PLATE V



[Crown Copyright.]

A. A CORRIE ON BLAVEN IN SKYE

A tarn, half-filled by a delta, lies at the bottom of the corrie, which has been formed in the gabbro and granite of this mountain mass. The sharp peaks, steep slopes, and gullies cut by torrents and landslides give a wild, grim aspect to the scenery.



[Crown Copyright.]

B. A TYPICAL U-SHAPED VALLEY

Glen Tilt, to the northeast of Blair Atholl in Perthshire.

[To face page 22.]

PLATE VI



[Crown Copyright.]

A. A VOLCANIC NECK

This is North Berwick Law in Haddingtonshire. The hard trachyte plug of an ancient volcano has been left to form a hill after the erosion of the softer rock which formerly enclosed it



[Crown Copyright.]

B. A RAISED BEACH AT KESSOCK FERRY, ROSS

The shelf on which the village stands was formerly a submerged wave-cut platform. A new beach has been formed at a lower level. The raised beach is now 100 feet above the sea.

which runs between Britain and Ireland along the bottom of the North Channel, the Irish Sea, and St. George's Channel, suggests comparison with the Shannon, since it follows a parallel course and has a strong resemblance to the great Irish river. We are therefore led to conclude that these valleys, though now submerged, were of subaerial formation and that previous to the subsidence which drowned them the British Isles stood at a higher level than they do at present and were joined to the Continent. It now remains to determine the date at which they were separated from the mainland.

There are several established facts which enable the date of the formation of the Straits of Dover to be determined approximately. The connexion of England with the Continent at the close of the Pliocene and the beginning of the Pleistocene is proved by the discovery in the Pliocene deposits (Forest beds) in the east of England of the bones of a number of mammals (elephants, rhinoceroses, and hippopotamuses) which are known to have inhabited the valley of the Somme at that period. These animals could not have passed from one country to the other, save on foot. The land-bridge is known to have been still in existence later in the Pleistocene, during the Ice Ages and even after the retreat of the ice, because the remains of mammoths are found in England and Ireland. Besides, traces of palæolithic man have been discovered near Plymouth and Bury St. Edmunds. The continuity of the dry land must be postulated for these animals and men to have crossed over. The land-bridge was wide and covered all the southern part of the North Sea, since the bones of land animals, such as mammoths, reindeer, and bears, have been and are still dredged up from the Dogger Bank. These finds show that the submarine plateaus were then great plains over which wandered the herds of beasts whose vertebræ and teeth fishermen bring to the surface at the present day. The bones of reindeer have been picked up in Jersey and in alluvial deposits in the Thames. This fixes the date of the separation of England from the Continent as subsequent to the existence of reindeer on the adjacent lands. In this way, the date of the formation of the Straits of Dover can be gradually narrowed down to the end of the Palæolithic or the beginning of the Neolithic Age.

The present fauna of Britain, which is the same as that on the Continent, could only have crossed over to the island before the formation of the Straits. Yet the disappearance of the land-bridge seems to have occurred before the migration of the fauna was complete, and communication appears to have been interrupted very early and movement of the fauna to have been checked before completion. The poverty of British fauna as compared with that

of the Continent is noticeably great : only forty species of mammals are recognised in Britain as against ninety in Germany and sixty in Scandinavia ; and thirteen species of reptiles and amphibians as against twenty-two in Belgium. Hence, the formation of the Straits of Dover must have taken place before all the continental animals had had time to pass over into Britain. Similarly, the astonishing poverty of Irish fauna as compared with that of Britain tends to show that the isolation of Ireland had preceded that of Britain.

The separation of Britain from the Continent belongs to the most recent period of the Earth's history and must have been witnessed by man. It was the last of the great series of events which broke the Atlantic continent into fragments and determined the present geographical features of northwestern Europe.

The British Isles consist of several thousands of islands which rise from the sea on the continental shelf. Two of them, Britain and Ireland, monopolise nearly the whole land area. Off their shores are a number of islands or groups of islands, most of which are in the Atlantic or the English Channel, few being found in the North Sea. Some, like the Isle of Wight, Anglesey, Arran, Islay, Jura, Mull, and Skye, are separated from the mainland by narrow channels ; whilst others, like the Isle of Man, the Hebrides, Orkneys, and Shetlands, stand by themselves, surrounded by broad stretches of sea. The isolated St. Kilda group rises far out in the Ocean more than forty miles from the Hebrides. The distance from the most northerly to the most southerly of the British Isles is roughly 800 miles.

3. RELIEF

Like the countries of Central Europe which share their architectural plan, the British Isles are marked by the subdivision and low elevation of their relief. Within a limited space they contain a number of compartments differing in relief, a succession of elevations and depressions. The frequent contact and the repeated contrast of highland and lowland must be regarded as characteristic of the country. By giving rise to differences in topography, the relief multiplies the number of little natural regions and local peculiarities.

There are no lofty snow-capped mountains or bare, rocky peaks in the British Isles. The highest point in England and Wales is Snowdon (3560 feet), in Scotland Ben Nevis (4406 feet), and in Ireland Carrantuchil (3414 feet). There are no intermontane plateaus, and the plains, like the Central Plain of Ireland, the Midland Valley of Scotland, and the English Plain, are all low-lying. The distribution of upland and lowland is due to geological

formation, for the uplands are hill-masses often composed of very resistant ancient rocks, whilst the lowlands are formed of more recent, sometimes quite young, and less resistant material. The uplands on the west of the British Isles belong to Archæan and

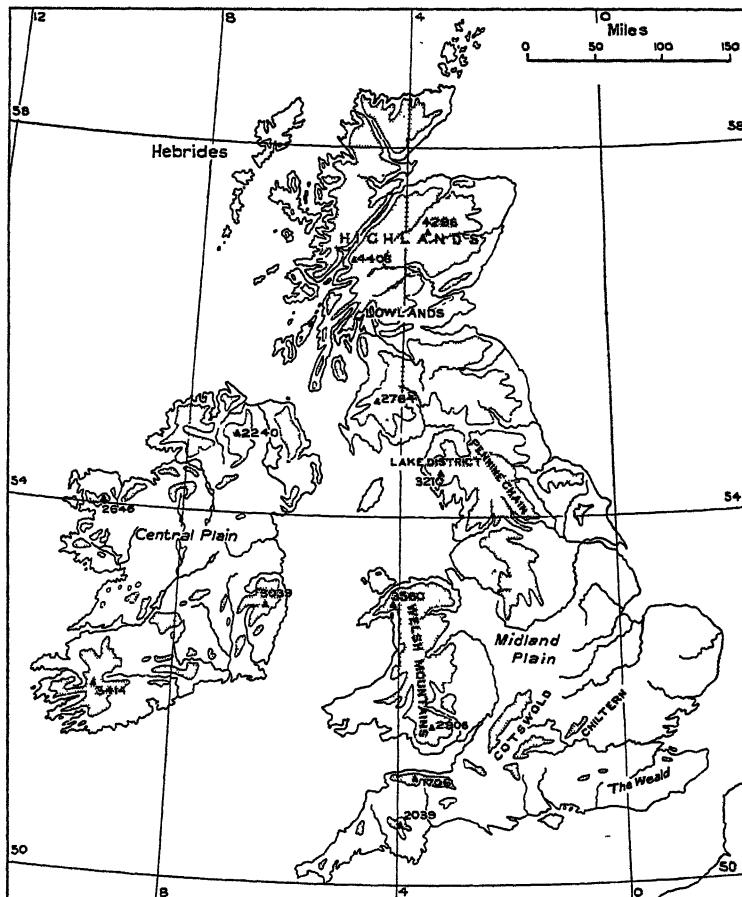


FIG. 5. Relief of the British Isles. The shaded portions, which denote areas over 600 feet above O.D., occur mainly in the north and west.

Palæozoic formations, whilst the English Plain forms part of the Germanic Depression which was gradually covered over by the sediments of the seas that existed in Secondary and Tertiary times.

But whatever the nature of the materials, the evolution of the relief has followed the general laws of denudation and has empha-

sised throughout the islands the predominant part played by the resistant rocks. It may be said that the highest parts of the relief are not those which were most uplifted, but rather those which have suffered least from the attacks of the forces of disintegration. Ancient structural highlands sometimes appear as depressions ; whilst others which in remote times were structural lowlands are now elevations, since their rocks have proved resistant. For instance, the Kilkenny coalfield in Ireland, which is synclinal by nature, now forms a high plateau (see Fig. 6). In the western uplands projections of very resistant eruptive rocks are often found right in the midst of ancient rocks. From the nature of their origin they are of bold relief and stand out as picturesque protuberances in the form of bosses and volcanic necks laid bare by the

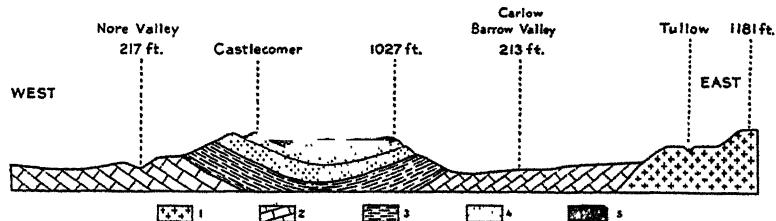


FIG. 6. Section across the Castlecomer Coalfield in Kilkenny. (After Hull.) This is an instance of invasion of relief : what was formerly a downfold is now an elevated plateau.

1. Granite of the Wicklow Mountains.
2. Carboniferous limestone.
3. Yoredale shales.
4. Millstone grit.
5. Coal measures.

removal of the less resistant material which once covered them. Such, for instance, are North Berwick Law, Largo Law, and the Bass Rock in the south of Scotland ; and the rough crags of Castle Hill and Arthur's Seat around which Edinburgh is built. In Wales the highest peaks (Snowdon, Cader Idris, and the Arenigs) are masses of particularly resistant, very ancient, eruptive rocks.

Wherever there is an isolated plateau or a bold peak, whenever an escarpment stands up above more regular slopes and level surfaces, resistant rocks have caused the elevated features. This is the case in the Cheviots, Dartmoor, and the Mourne Mountains ; the igneous rock-masses of Charnwood Forest, Caer Caradoc, the Wrekin, and the Malvern Hills in the Midlands of England ; the ridge of Old Red Sandstone in the south of Ireland ; the huge beds of carboniferous limestone in the Pennines ; the oolitic strata of the Cotswolds ; and the chalk of the Chilterns and Downs.

The contrast between hard and soft rocks differentiates the uplands from the lowlands. In the former the streams have not been able to cut wide valleys in the resistant rocks, but flow at the bottom of narrow gorges whose slopes are still very steep, so that the valleys are sometimes the only places from which one can realise the presence of hills. This is the case in Glen Garry amid the wild gorges of the Pass of Killiecrankie in the Grampians ; and in all the valleys in Scotland and Ireland, which empty into the Atlantic through the deep gashes they have cut in the flanks of the plateaus. On the other hand, in the lowlands which are basins or vales of softer rocks the skyline is lower and the valleys broaden out and, by uniting, form plains. Valleys which are shut in among the hills open out on issuing from them, as do those of the Dee and Severn when they leave the Welsh Mountains, and of the Tees, Wharfe, and Aire on debouching from the Pennines.

Within the upland regions themselves, differences of relief are due to differences in the rocks. Between the hard rocks of the Highlands and those of the Southern Uplands, the Midland Valley occupies a series of wide depressions in the softer layers of Old Red Sandstone, the Carboniferous, and the Coal Measures. The Central Plain of Ireland extends over layers of soluble limestone between the uplands of the north and south ; and the low troughs which divide the uplands themselves into isolated blocks follow belts of the same limestone. The troughs are, in fact, extensions of the plain which, helped by the weaker resistance of the rocks, have penetrated the uplands. Similarly, in the northern part of the English Plain the low-lying and almost flat surface of Cheshire and the Midlands coincides with the soft marls of the Trias.

Erosion, which carves out the topography and gives it its form, ends by producing almost flat surfaces. Several times in the course of ages it has almost completely levelled the country ; as often the land has been uplifted again, and the flat or slightly uneven surfaces have reached the levels at which they are to-day. Wide terraces rising like steps to different heights form the predominant characteristic of the topography. If one climbs up on to the mountains from the deep-cut valleys of the Scottish Highlands, one comes to broad plateaus which contain no real outstanding peaks. The highest points scarcely rise above the lowest, and the features are all blended in the regularity and monotony of the bare surface. If one descended from Ben Macdhui in the Grampians towards the Moray Firth without actually leaving the high ground, one would travel down an almost imperceptible slope whose gradient would be less steep than that of many railways. If on a relief model of Ireland the tops of the chief mountain ranges

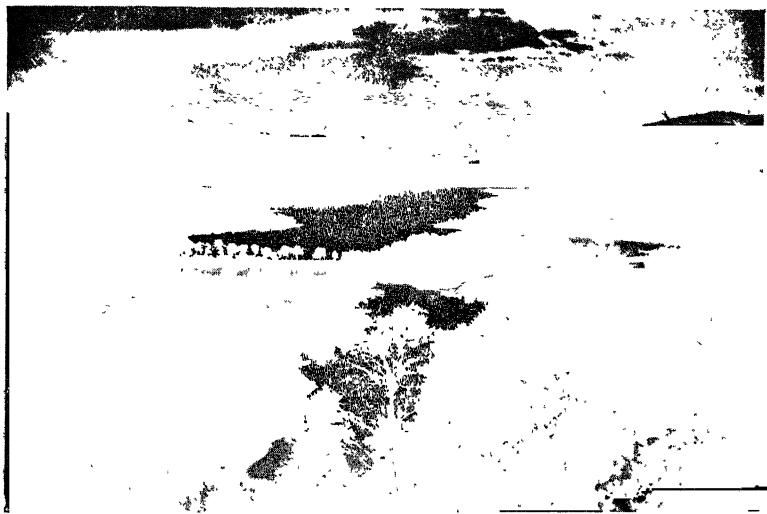
were joined, an almost level surface would result, standing at an elevation of between 2500 and 3000 feet above sea level. The summit of Snowdon commands a striking view of wide flat areas which average 2000 feet high in parts, and between 700 and 1000 in others. Almost everywhere in Scotland, Ireland, Devon, and the Isle of Arran similar terraces may be seen at varying heights in the uplands. The impression given by this is that the evolution of the relief was accomplished in a succession of phases during which the land was levelled. Such a series of phases would explain the predominance in the topography of plateau-forms, the prevalence of regular skylines, and the monotonous grandeur of high, uniform surfaces—features which manifest the work of denudation in a past age and a well-matured topography (see Plates I and II). Young, bold, and occasionally very broken forms are found only in the valley-bottoms near the swift-flowing streams which reach the sea through wild gorges and steep, irregular gradients.

The influence of structure is not apparent in this smooth topography. The connexion between the drainage system and the structure—which is so evident in recently folded ranges—is completely wanting, for the folds do not control the direction of the streams. Over the level surfaces the streams follow slopes of recent formation and sometimes carve valleys which have no relation to the trend lines of the ancient folds or the now levelled features of ages gone by. In Scotland a number of ancient faults cut across a series of valleys (Lochs Earn, Tay, Tummel, Glen Dochart, Glen Lyon, and Loch Rannoch) without in any way affecting their topography. The explanation is that these valleys have recently been formed in the smooth surface of this part of the Highlands. To reach the sea some of the rivers seem to follow an unnatural course by flowing across both folds and faults. The Tay as it leaves the Grampians, and the Slaney and Blackwater in the south of Ireland, are examples of this. But, indeed, they have had no obstacle to cross and no barrier to saw through: from the first they have flowed on a level surface, and, when this surface was uplifted, they cut into it and carved out their courses through dislocations in the rocks.

4. THE INFLUENCE OF FORMER GLACIATION

In the British Isles there are traces of two glacial periods which differ from one another in extent and effects. The first period was one of widespread glaciation, when probably the whole country was covered with ice as far south as the Thames. The second period was one of local glaciation and was confined to the valleys

PLATE VII



[Photo: Valentine.]

A. LOCH TUMMEL, PERTHSHIRE

A typical Scottish loch. The valley, through which a glacier formerly passed, is wide and wooded.



[Photo: Valentine.]

B. LOCH EPORT, UIST

The land surface has been planed by ice. The loch is dotted with islands; long, narrow inlets run into the land; and lakes fill the numerous hollows.

PLATE VIII



[Crown Copyright.]

THE MORAY FIRTH

The Firth is divided into an inner and outer basin by spits which are clearly seen in the photograph. The shingle spit with the characteristic hook in the middle of the picture is occupied by Fort George, whilst on the far side of the water, on the left, appears Chanonry Point. The cultivated area in the foreground stands on a raised beach.

lying in the more elevated uplands. Ice has greatly influenced the relief of the British Isles by clearly marked erosion and by deposition. But the results of its action vary considerably according as they were due to widespread or to local glaciation.



FIG. 7. The greatest extension of Quaternary Glaciers in the British Isles.
(After Geikie.)

1. Exact southern limit.
2. Approximate limit in the Atlantic.

WIDESPREAD GLACIATION. At one time the uplands of England, Scotland, and Wales were all covered by sheets of ice which moved outwards in all directions, following the existing topographical lines (see Fig. 7). In the western Highlands the ice was more than 3000 feet thick in certain places. It overflowed towards the north-

west, filled the Minch, completely over-ran the Hebrides, and ended right out in the Atlantic in a high cliff-face from which icebergs calved off. In the northwest it moved through the Moray Firth to the Orkneys and Shetlands. Southeastwards, it filled the Midland Plain, completely burying the Pentland, Ochill, and Sidlaw Hills,

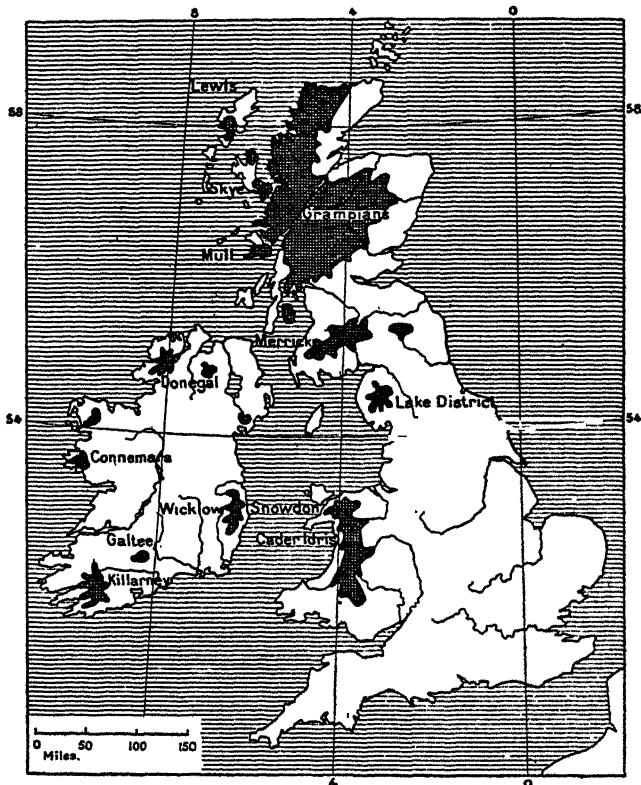


FIG. 8. Local Glaciation in the last Ice Age. The most recent traces of ice action are found to-day in the shaded areas. They consist mainly of corries, moraines, and glacial lakes.

on which striations are observed at a height of 1150 feet. The most powerful stream of ice originated in the west of the central Highlands, where the winds from over the sea precipitated enormous quantities of snow. Moving through the Firth of Clyde and the North Channel, it entered the Irish Sea, where it was reinforced by other streams from the Southern Uplands and Cumberland. Spreading out, it over-ran Anglesey and the more westerly peninsulas of Wales as far as St. David's Head. This enormous stream of ice also

penetrated the Cheshire gateway into the English Plain, joined the glaciers from the Pennines and Wales, and continued to the Bristol Channel.

At the same time other streams of ice which had originated in Scotland and the Lake District issued through the valleys of the Tyne, Tees, and Ouse on to the northeastern portion of the English Plain and advanced right beyond York. Near Birmingham are found erratic blocks which have come from Wales, and others derived from Cumberland occur on the banks of the Humber. The glacier-flows of the British Isles received reinforcements from Scandinavia. Evidence of this is found in striations and deposits on the east coast of Britain from Dunbar to Cambridge. In Ireland the mountain ranges in the north were also centres of glaciation. Ice-streams completely over-ran the Central Plain and in the neighbourhood of Dublin met the vast flow from Scotland and Cumberland, which was moving over the bottom of the Irish Sea.

The impress of glacial action has been firmly stamped on the relief of the British Isles. It formed the smooth, rocky surfaces which in Scotland stretch over the greater part of Sutherland, Ross, and the Hebrides, and in Ireland over Donegal and Mayo, and which are marked by *roches moutonnées*, an absence of loose material, and a sprinkling of dismal lonely tarns (see Fig. 41). Here and there on these monotonously uniform surfaces the ice has left erratic blocks. Sometimes they stand like ruined castles on the bare ridges ; thus, Clogh Currill between Recess and Kilkieran in Galway. According to legend, the giant Currill tore this mass of rock from the Corcogemore Hills to throw at his enemy Moidan who was carrying off his daughter ; and the marks of his fingers are pointed out at the base of the blocks. At other times, as on the flanks of Carrick in Scotland, they are huddled together in groups which from a distance look like flocks of sheep. All these blocks occupy an important place in popular legends, being regarded as 'Giants' stones,' 'Giants' graves,' and as rocks set up or transported by heroic personages.

In the plains and valleys of the lowlands there have accumulated thick layers of deposits left by the ice. These are either waste from the ground moraines or else trails of alluvium. The morainic matter, which is termed *boulder clay* or *till*, forms series of hillocks known as drumlins, having their long axes in the same direction as the movement of the ice. Such oblong elevations running parallel with each other afford one of the most peculiar features in a glaciated landscape. They are found in large numbers along the shores of Cromarty and Moray Firths, in Strathmore, in the valleys of the Tweed and Nith, and in central Ireland.

The low islands which occur in Donegal Bay are partly submerged

drumlins. Elsewhere, boulder clay spreads out in uniform sheets without giving rise to special topographical forms. A mantle varying from a few inches to a hundred feet thick thus covers the surface rocks almost continuously in large areas in the counties of

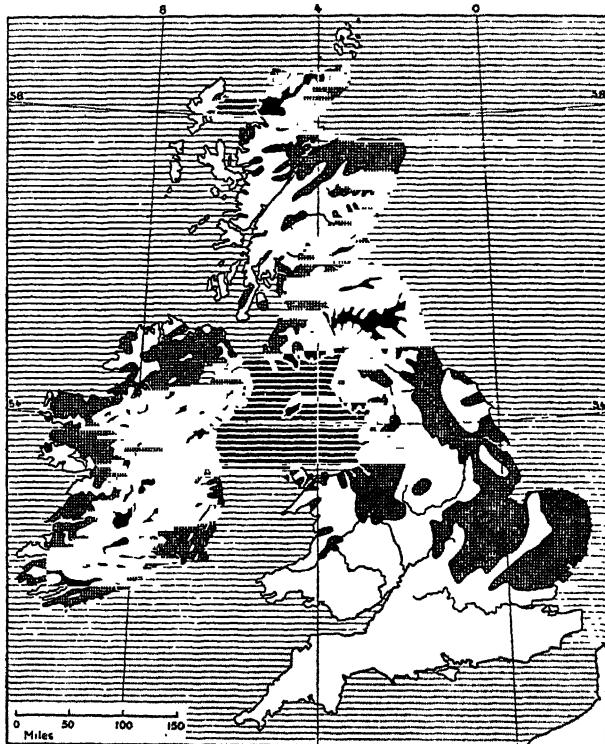


FIG. 9. Distribution of Glacial Deposits. (After Lamplugh, Geikie, and Kilroe.) The shaded areas are surfaced mainly with glacial deposits and include most of the fertile lowland districts. These deposits either do not occur or are very slight on the uplands of the north and west as well as in southern England, which was not over-run by the quaternary ice-cap.

Lincoln, Norfolk, Suffolk, Cambridge, Bedford, Hertford, and Essex (see Fig. 9). It is generally known as *drift*.

The layers of glacial deposits have sometimes very extensively transformed pre-glacial topography by filling up and burying the surface details. At the present day there is often no trace of the existence of ancient valleys which have been filled with drift, and thus it sometimes happens when mine-shafts are driven through them in Durham and Northumberland that the saturated sand and gravel of their surfaces cause disastrous floods. Such old drift-

choked watercourses are found to some extent everywhere beneath the covering of glacial deposits. At other times the streams, unable to flow through the obstructions in their courses, have turned aside to find another course nearby. This is what has happened to the Water of Gregg above Barr in the south of Ayrshire and to the Lee below Macroom in the south of Ireland.

At other times again, a simple morainic dam across the valley has sufficed to divert a stream. Thus, before the Ice Ages the Wear flowed into the Tees, while the latter ran southwestwards into the valleys of the Leven and Esk. The most remarkable instance of this kind of diversion occurs in the Vale of Pickering. Previous to the Ice Ages, this depression drained due eastwards into the sea. During the Ice Ages thick layers of deposits, which may be seen clearly in the cliffs south of Filey, blocked this exit. The drainage, deprived of its outlet, accumulated to form a lake which finally overflowed through the valley of the Derwent, one of the tributaries of the Ouse. To reach its base level, the outflowing stream cuts its way through the hills south of Malton, thus forming the gorges near Kirkham Abbey.

LOCAL GLACIATION. After the retreat of the great ice-cap, the country underwent another period of cold; but the glaciation was not so extensive (see Fig. 8). Each upland region in the British Isles had its own system of alpine glaciers, traces of whose work are confined to the valleys and depressions of the region. The evidence of this glaciation still appears quite fresh and recent, as if the retreat of the ice took place but yesterday. Every valley in the Highlands of Scotland affords an instance of that curious morainic topography which is characterised by a confusion of hillocks, knolls, and rises. On the west coast moraines occur right down to sea level. In the Lake District they strew the bottoms of all the large valleys like Borrowdale, Rosthwaite Plain, and Langstrath. Bleawater Tarn near Hawes Water is caused by a morainic dam. The same mammilated forms and confused heaps of rock-waste are found in the valleys radiating from Snowdon and in those that issue from the main upland regions in Ireland, from Donegal and Mayo to Wicklow and Kerry (see Plate IVB).

Above the terminal moraines in these valleys glacial influence is everywhere conspicuous. Near the tops of the hills the valley-heads widen out into steep-sided corries, which are known in Wales as *cwmns* (see Fig. 40). These corries, whose bottoms are often filled by placid tarns, lead into the valleys by steep, abrupt slopes. Each of them represents a centre of glacial erosion and cuts deeply into the mountain. Sometimes they are so close together as to leave between them only inaccessible, knife-edge ridges. This wild and

jagged topography is the special mark of glaciation in high ground whose main features have been carved out by long ages of normal denudation. Nowhere is it more beautiful and more imposing than on the northern and northeastern slopes of Snowdon. Throughout the Highlands of Scotland the same familiar results of glacial action are recognisable in the hanging valleys whose streams precipitate themselves into the main valleys by rapids or cascades ; in the U-shaped cross-sections of the straight, steep-sided valleys which result from the destruction by the ice of the windings and meanders cut by the streams in the rock ; and in the irregular longitudinal sections caused by an alternation of flat-bottomed hollows and rocky dams. Often the valley-bottoms are deeply hollowed out and contain big ribbon-lakes dotted with rocky islets in the form of *roches moutonnées* (see Plate VIIA).

These lakes are proper to the glaciated landscape and are found in all the upland centres of glaciation in Ireland, the Lake District of England, and North Wales. But they are most frequent in Scotland. In fact, their distribution in that country indicates the distribution of the ancient glaciers. They are very rare in the eastern Grampians and do not occur in the Midland Valley. On the other hand, in the western Highlands which were exposed to the winds from over the ocean and were therefore centres of intense glaciation, every valley contains its loch. Lochs Maree, Fannich, Quoich, Arkaig, Ness, Ericht, Rannoch, Awe, Tay, Katrine, and Lomond are all Highland gems which occupy rocky hollows and form a series of basins separated by sills. Such lakes are evidently the result of the flooding of a valley after it had been carved and chiselled by the ice. Sometimes they are of great depth. The lead reaches bottom at 541 feet in Loch Katrine, at 557 feet in Loch Tay, and at 1000 feet in Loch Morar. The last-mentioned depth is greater than that of the sea off the neighbouring coast. According to Geikie, it is, with the exception of the Norwegian Trench, the deepest depression in the continental shelf on which the British Isles stand.

But for the work of glaciers, the relief of the British Isles would be very different from what it is. The mountains would have kept intact the smooth surfaces which crowned them ; they would contain neither the precipitous-sided corries, nor the serrated ridges, nor the widened valleys with humpy, irregular bottoms, nor the great ribbon lakes. As in the Central Highlands of France, there would be less rugged hills, narrower and more gorge-like valleys, and more vigorous streams whose strength would not be lost in lakes. In the lowlands there would be no covering of drift to hide the variety of geological formation and to spread uniformity over the surface of the country.

PLATE IX



[Photo: Lawrence.

A. A RIA ON THE IRISH COAST NEAR GLENGARRIFF AT THE INNER END OF
BANTRY BAY



[Photo: Lawrence.

B. THE LIGHTHOUSE ON VALENTIA ISLAND

This is a typical ria coast. Long, rocky peninsulas separate inlets which run far into the land. The high ground is moorland.

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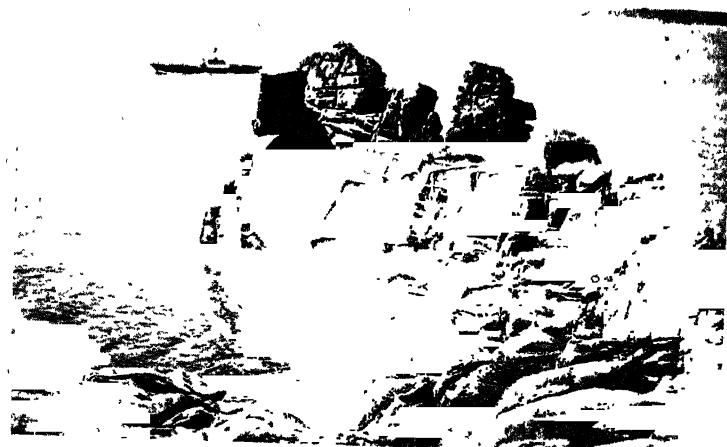
PLATE X



[Photo: Lawrence.

A. LOUGH SWILLY

A former glacial valley, now drowned by the sea.



[Photo: Preston, Penzance.

B. A WAVE-WORN COAST IN THE SCILLY ISLES

Erosion acts along the joints in the crystalline rocks, and thus in the end breaks up the most resistant material.

5. THE COASTS

The outline of the coasts of the British Isles is closely related to the relief of the land and is due to the partial submergence of a surface in which there is an alternation of high and low ground. The high relief ends in peninsulas that jut out into the sea, whilst the depressions have become re-entrants up which the sea has advanced. In Ireland bights have been formed where the lowlands of carboniferous limestone reach the sea. Hence the formation of Lough Foyle, Sligo, Donegal, Kilala, Clew, and Galway Bays, the bays in Kerry, Dundalk and Dublin Bays, and Cork Harbour. Belfast Harbour occupies a depression in the Triassic clays and marls. Between all these low-lying, submerged areas run peninsulas or promontories of hard rock.

In Scotland the two deep re-entrants of the Firth of Clyde and the Firths of Forth and Tay penetrate right into the Midland Valley and give the country a narrow waist. In England the ancient rocks of Cumberland, Wales, and Cornwall jut out into the sea, whilst between them the sea invades the low plains formed of soft layers of the Trias, thus causing the Solway Firth, Liverpool Bay, and the Bristol Channel. Just as in France the high relief of the Boulonnais district projects into the sea between the Maritime Plain of Flanders and the Somme valley, so the Kentish Downs end in the broad Foreland which takes the English coast to within twenty-one miles of France. On the North Sea coast the Wash marks an advance of the sea over a low-lying plain of Jurassic clays. Hence, the main coastal features are directly due to the relief of the land. But the relation between coastal forms and relief explains only the larger and more conspicuous inlets and peninsulas. There remain to be explained the multitude of irregularities in the coastline, the long estuaries through which the sea penetrates far inland, the presence or absence of cliffs, and the various types of minor features. The whole evolution of the shorelines postulates changes in the sea level and illustrates the action of marine erosion.

POSITIVE AND NEGATIVE MOVEMENT. During the Ice Ages and even for some time after, the British Isles stood at a relatively higher level than they do to-day. Numerous proofs of this are found throughout the country. They are furnished particularly by the valleys which were formed by erosion before the Ice Ages, and whose bottoms lie to-day well below the present level of the sea. In the Scottish Lowlands between Kilsyth and Grangemouth, soundings in the Firth of Forth have established the existence of a fossil, drift-filled valley which lies at a depth of 300 feet below sea level. In the valley of the Kelvin, a feeder of the Clyde which

enters the main stream below Glasgow, rock bottom is reached at a depth of 300 feet through a thick layer of alluvium. At Glemsford in Suffolk and at Runcorn at the head of the Mersey estuary similar pre-glacial valleys have been observed which have been filled with quantities of transported rock-waste. It is evident that all these

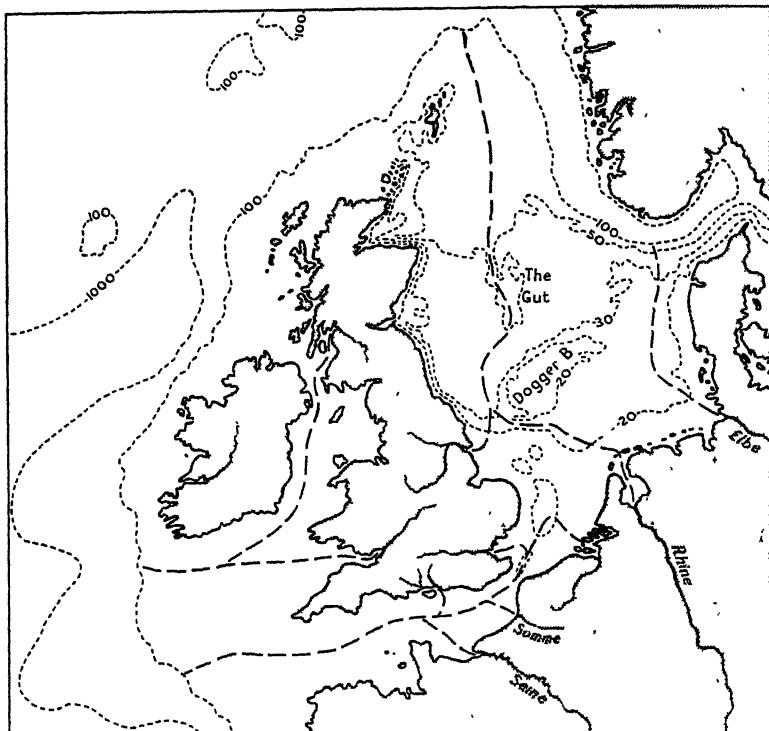


FIG. 10. Probable Drainage System of the British Seas at the end of the Ice Age. (After Gregory.) Depths are given in fathoms. The 100-fathom contour approximately represents the coastline at that time.

valleys, though now buried, were cut into the surface at a time when the land stood higher than it does to-day.

This period of emergence lasted until after the beginning of post-glacial times, for the valleys of existing rivers also have their bottoms at a far lower level than that of the sea. On the coast of Devon, Cornwall, and Wales there are many places, like Milford Haven, Barmouth, Swansea, Chepstow, Maypool, Plymouth, Fowey, and Falmouth, where the rock bottoms of the valleys opening into the Atlantic can only be reached by boring through a filling of alluvium

to depths of from 30 to 130 feet below the level of the low-water mark. So, for a very long time during a remote period the British Isles stood at a higher level than they now do, relatively to the surface of the sea. It was the same with the Baltic Lands, for at this very time the Baltic was a vast lake, and its water drained into the North Sea through a series of river channels whose courses are recognisable to-day in the Sound and the Great and Little Belts at depths of 280, 250, and 180 feet respectively.

The period of emergence was followed by one of submergence which had decisive effects on the pattern of the coastline of the British Isles. The sea entered the lower ends of all the valleys, which then became fjords, rias, or estuaries, according to circum-

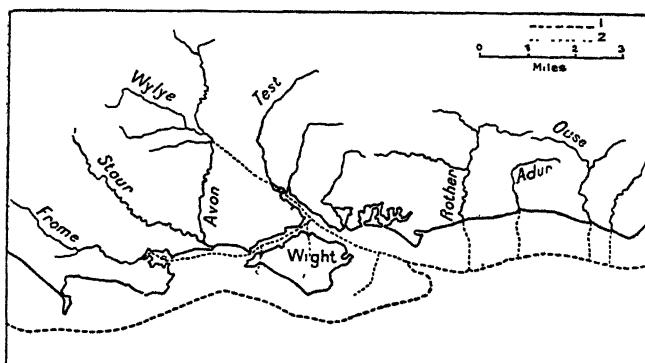


FIG. 11. Drainage System of the Solent before the last Positive Movement.

stances. It was doubtless at this time too that the British Isles were finally isolated by the formation of the Straits of Dover.

The latter event does not seem to have been due to the action of the waves on the isthmus, but to the submergence of what had become a low ridge. The network of valleys which drained the plains now occupied by the English Channel and the North Sea (see Fig. 10) had long been paving the way for this. The headwaters of a river which flowed along the bottom of the present English Channel had eaten their way back through the isthmus to meet those of the North Sea drainage system, and had thus formed the wide saddle which the sea on rising made into a strait. The Isle of Wight was cut off from the mainland by the same process. Gravel plateaus some 100 to 130 feet high extend along both shores of the Solent from Poole Harbour to Spithead. These clearly mark the existence of a river valley which ran eastwards from the direction

of Dorchester and reached the sea between Portsmouth and Brighton. This valley has been drowned and is now the Solent.

The same submergence carried the sea up into the lower ends of the valleys. Two types of drowned valleys are to be distinguished according to the nature of the subaerial formation. These are fjords in regions of intense glaciation, and rias and estuaries in unglaciated areas. The long, narrow inlets called *fjords* in Norway are also found in Scotland, where they are termed *sea-lochs*, and in Ireland, where they are known as *loughs*. On the west coast of Scotland they do not occur south of the Clyde; and in Ireland they are confined to the northern region between the Bays of Galway and Dundrum. Such drowned valleys exhibit beneath the water all the features of glacial topography, that is, steep sides, a U-shaped cross-section, and in their longitudinal section an alternation of hollows and rocky ridges. Soundings reveal this curious formation of the bottom in all the lochs and loughs. In Loch Erriboll, for instance, there is a series of hollows 216, 197, and 341 feet deep respectively, separated by ridges whose respective depths are 161, 193, and 167 feet. There are five basins in Loch Hourn to the southeast of Skye, six in Loch Sunart, and seven in Loch Etive. In Ireland the bottom of Sligo Bay is divided into seven basins with respective depths of 456, 443, 210, 121, 167, 72, and 138 feet, separated by ridges 384, 36, 79, 66, 30, 26, and 20 feet deep (see Plate XA). The combination of glacial and coastal forms is not confined to the lower ends of the valleys, for off the coast of Scotland extends a whole fringe of islands and of sounds, or *kyles*. These narrow channels are merely extensions of valleys on the mainland. Beneath the deep waters of the Clyde it is possible to recognise the basins and ridges which are so characteristic of glacial action. The fringe of islands and long peninsulas are fragmentary extensions of the glaciated mainland. The topography of the whole of this large area into which the sea has only recently penetrated has been fashioned by ice.

In the more southerly parts of the British Isles the sea, as it advanced inland, was confronted by topography which was free from glacial influence. Whenever it penetrated into steep-sided valleys, in an upland region, it formed long, winding estuaries which look like fjords, but have bottoms that slope gradually down to the sea. These are rias, a type peculiar to the upland areas of ancient rocks which jut out into the Atlantic. They are the cause of the indented, jagged coasts which occur in the south of Ireland, Wales, Cornwall and Devon, Brittany, and Galicia (see Plate IX).

Whenever submergence drowns an area consisting of relatively smooth plains and low hills, the sea advances up wide channels far

into the interior of the land. This is how the great estuaries of the Thames and Humber, Mersey and Severn, with their flat shores, have been formed ; and so too were the tidal mouths of the Schelde, Maas, Rhine, Weser, and Elbe. Through them has developed the intimate association of sea and land which is one of the peculiar features of the physical and economic evolution of the North Sea countries. No other country has such a long coastline in proportion to its area as England has, namely, one mile of coast to every 25 square miles of surface. This should be contrasted with France's one mile of coast to 66 square miles of area. In no other country does the sea run so far inland or the tide penetrate so deeply. Hull, Goole, and London are 20, 30, and 40 miles respectively from the sea. It will be seen, moreover, that the estuaries run towards each other from opposite coasts, so that no part of Ireland is more than 56 miles from the sea, and in Britain the greatest distance is 74 miles.

OLD STRANDLINES AND RAISED BEACHES. During the positive and negative movements which caused the displacement of the strandlines there were periods of rest, in which the sea remained long enough at certain levels to carve out beaches and leave deposits on them. Hence, along the coasts of the British Isles lines of raised beaches with more or less horizontal terraces of varying width and standing at levels higher than the present strand form one of the most curious features of coastal topography. The highest of these terraces is between 100 and 120 feet above the sea and is most clearly visible on the shores of the larger firths in eastern Scotland and along the Clyde. They have been observed also on the coasts of Northumberland and Durham, as well as at several points on the Irish coast, but, as these rest on loose drift, they have preserved neither their form nor their continuity. Another terrace is visible at a height of 50 to 65 feet on the shores of the Firths of Forth and Tay. It is remarkably well developed between Falkirk and Stirling, where the land is almost flat and the soil is of clay or a mixture of clay and marl. In Neolithic times this Carse, as it is called locally, was a fertile area bounded by estuaries and supporting a numerous population whose tools, implements, and boats are occasionally found to-day. In modern times it is still fertile and is divided between the local government areas of Stirling, Falkirk, and Gowrie, whose names its several parts bear.

The lowest of the terraces, which is nevertheless the most continuous and most clearly marked, stands at about 23 to 26 feet above sea level. Along the Firths of Clyde, Forth, and Tay it appears as a belt of flat ground varying in breadth from 50 yards to one or two miles. Although on the shores of the estuaries it has been formed on glacial deposits, it has been carved out of the

solid rock in other places, such as Bute, Arran, and Skye. In the last case, the streams have cut deeply into the terrace and fall over it in rapids before reaching the sea. This terrace, whose formation Munro places at the beginning of the Bronze Age, is found all round the coast of Scotland. Few events in nature have had more influence on human life than the prolonged continuance of the strandline at this level. The part played by the terrace, with its fertile, friable soil consisting of marine deposits, has been of immense importance in human settlement, for, raised above the reach of the highest tides and placed in front of the barren, rocky slopes of the interior, it has afforded a remarkably good site for habitation. The towns of Leith, Burntisland, Dundee, Arbroath, Cromarty, Rothesay, Greenock, Ardrossan, and Ayr are all built on it, and it has determined the sites of a continuous line of villages and little towns along the shores of the Firth of Clyde, Glasgow itself standing, at least partly, on it. Nearly all the ports in Scotland are situated on this 23 to 26 foot terrace, which shows the same connexion as has been observed on the coasts of Norway between the deposits of friable soil and human habitation.

Though the terraces are a characteristic feature of the whole coastline, they are far more marked in the north than in the south of the British Isles. It would seem as if the vertical oscillations of the shoreline reached their maximum in Scotland and in the north of Ireland ; whilst in the south of England the 23 to 26 foot terrace tends to fall to the level of the shore deposits at the present high water mark.

THE DETAIL OF COASTAL TOPOGRAPHY. On the irregular coast-lines caused by the alternation of upland and plain and by vertical oscillations of the strandlines, the sea untiringly pursues its work of destruction and smoothing out. But its action does not end in the same forms on high as on low coasts or on the shores of the Atlantic as on those of the North Sea. The same contrast is observed between the broken coastline on the west and the smoother lines of the east of the British Isles as between the two coasts of the Scandinavian Peninsula, one of which faces the ocean, whilst the other borders on a continental sea. On the west the present coastline differs little from that which existed at the completion of the last movement of submergence ; but on the east the coastline is becoming more regular owing to the destruction of headlands and the filling up of bays. This process can actually be observed. The headlands are being worn away by the attacks of the waves ; whilst masses of shingle, sand, and mud are being deposited in the bays and estuaries. Irregularities are being rubbed off or filled in. Along the Thames, Wash, and Humber areas of low ground are continually

emerging from the sea and being annexed to the dry land by means of dykes.

Glacial topography is being effaced on the east coast of Scotland, and the traces of the ancient glaciers are scarcely discernible in the firths. In the Firth of Forth it is still possible to recognise to the north of Inch Garvie, to the south of Inch Colme, and to the north of Inch Keith a number of long depressions which resemble a series of basins such as are found in the bottoms of fjords ; and hollows of the same kind still exist also in the Firths of Tay, Beauly, and Cromarty. But, as a whole, the undersea topography of the coast bears evidence of the general advance of sedimentation, and banks of sand and mud obstruct the estuaries and sometimes render navigation dangerous (see Plate VIII). Carlingford Lough, a fjord in the northeast of Ireland, is actually being reclaimed. The same process of smoothing out the coastline is at work all round the Irish Sea and may be observed in the Solway Firth, Morecambe Bay, Liverpool Bay, and Dundalk and Dublin Bays. Part of the last named has already been silted up, and some quarters of Dublin occupy areas recently reclaimed from the sea. A spit of sand and shingle joins the rocky islet of Howth to the mainland. On the shores of the Shannon estuary broad strips of grass-covered land, known as *corcasses*, extend over areas retrieved from the waves.

On the other hand, the sea works less quickly on the coasts of the uplands which face the Atlantic, and the smoothing out of the coastline progresses slowly there. The coasts still preserve their notches, indentations, their deeply penetrating bays, and their deep water ; they still have their bold, fresh marks of youth. They represent the mountainous face of the British Isles, the solid front which yields only very gradually to the attacks of the waves (see Plates XB and XI). If they are crumbling, nevertheless they are not giving way wholesale, as do the masses of chalk, clay, limestone, and sand on the east coasts. Out of the 5500 islands which comprise the British Isles, more than 5000 are scattered off the western shores.

The destructive action of the sea, which is violent and continuous on the shores of the Narrow Seas, causes a vague, ever-present anxiety in the minds of the people of England. The losses of territory which have been going on for centuries rightly inspire some uneasiness. A commission, appointed especially to report on the erosion of the coast, stated that between 1875 and 1910 the British Isles had lost 6576 acres, but had gained 37,091—mainly on the shores of the estuaries. The island has therefore nothing to fear. But these figures indicate the changes which are taking place along the coast in the process of evolution. What the sea takes from the cliffs and headlands it sweeps away and deposits in the bays and estuaries.

CHAPTER II

THE SEAS

I. THE HYDROGRAPHY OF THE ATLANTIC

THE hydrographic conditions of the Atlantic off the coasts of Europe depend essentially on the warm northeasterly current known as the North Atlantic Drift. This current is clearly marked by its relatively high temperature (see Fig. 12) and salinity even at great depths.

Off the northwest of Scotland the mean annual temperature of the surface water of the sea is between 48° F. and 50° F., and the salinity between 35·0 and 35·5 per mil. On the opposite side of the Atlantic in the same latitude sea temperatures of between 32° F. and 40° F. prevail, and the salinity of the water is less than 33·0 per mil. Furthermore, according to observations made by the *Valorous* in 1875 off the south of Cape Farewell in Greenland, the isotherm for 44·6° F. does not go down below a depth of 50 fathoms ; but according to observations taken on the *Lightning* in 1869 between the Færöes and the Shetlands, the same isotherm reaches a depth of more than 500 fathoms. High temperature and salinity are not confined to the surface of the Drift, but are found at considerable depths. South of the Wyville-Thomson Ridge they penetrate down to about 650 fathoms.

The origin of the warm water was long attributed to the Gulf Stream. It was thought that the North Atlantic Drift was but a continuation of the famous current which issues from the Gulf of Mexico. After travelling along the shores of the United States, it was supposed to cross the ocean to the coast of Europe. Certain facts, like the course followed by drifting plants and wreckage, seemed to indicate a vast movement of water from North America to Europe ; furthermore, the existence between Florida and the Bahamas of a swift-flowing current, with a maximum velocity of 125 miles a day, a depth of 80 fathoms, and a temperature of 68° F., could not fail to be noticed. Actually, the Gulf Stream comes to an end at the outer edge of the Newfoundland Banks at a distance of more than 1750 miles from Ireland. Beyond this point it loses its characteristic features, and there is no longer any question of an enormous warm 'stream' flowing in a bed of cold water.

The origin of the North Atlantic Drift is now universally attributed to the general system of atmospheric circulation over the Atlantic Ocean east of longitude 30°–40° W. The prevailing southwesterly winds produce a wholesale displacement of the warm surface waters from low latitudes towards the northeast. The Drift moves into high latitudes through the channels which the configuration of the land opens for it between Iceland and Scotland and especially between the Færöes and Scotland. On its way through colder regions it fashions a new influence for itself, for it becomes the seat of barometric depressions which carry the warm air still farther north and with it the warm waters of the North Atlantic Drift.

This explanation is certainly not the only one possible. It does not adequately explain the presence of warm and very salt water

Depth in Fathoms.	Temperature.	
	North of the Wyville-Thomson Ridge.	South of the Wyville-Thomson Ridge.
0	49°F.	52°F.
50	46	50
100	45	50
150	44	49
200	38	49
275	33	48
325	32·2	—

at such great depths in the east of the Atlantic, for the movement of surface waters under the constant impulse of the wind cannot be regarded as the cause of such a great accumulation as does in fact occur. Recent observations have discovered a warm, salt current which issues from the Mediterranean by the Straits of Gibraltar and, deflected along the west coast of Europe by the rotation of the Earth, travels at a depth of between 300 and 500 fathoms as far as the neighbourhood of Rockall, a tiny rocky island situated 190 miles west of the Hebrides. The existence of this layer of warm water, which was suspected as far back as the voyage of the *Porcupine*, observed by Nansen in the Bay of Biscay, and confirmed by the *Planet* in 1906, can only be explained as of Mediterranean origin. It is partly the cause of the higher temperature and salinity of the deeper waters of the eastern Atlantic as compared with the western and indeed with those of any other sea in the world at similar depths. The fact is that along the continental shelf of

Europe there is a great accumulation of warm water reaching to a depth of 400 to 500 fathoms.

The hydrographic conditions of the deeper waters of the Atlantic off the coast of Europe afford a striking contrast with those of the sea off the west coast of Norway. The Wyville-Thomson Ridge, which connects Iceland and Britain, causes a remarkable difference between the Atlantic and Arctic regions. On either side of this narrow ridge, which acts as a huge partition, there is a great difference

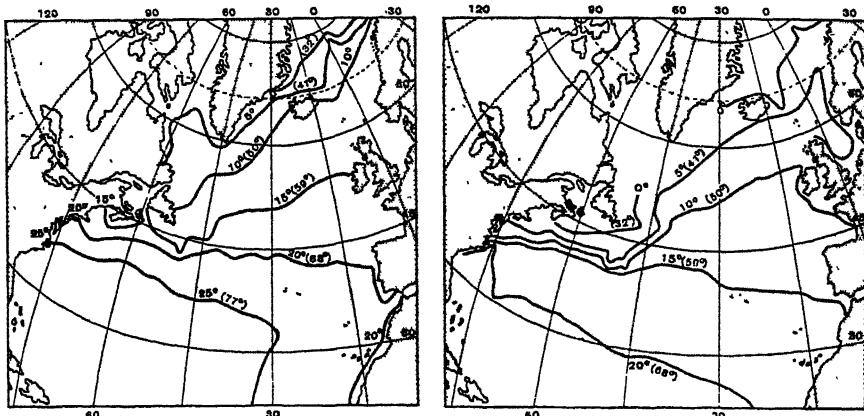


FIG. 12. Surface Temperature of the North Atlantic. (After the *Atlas Atlantischer Ozean*.) The left-hand map shows conditions in August, the right-hand map those in February. It is clear that, latitude for latitude, the surface waters of the Atlantic north of Lat. 45° N. are always warmer off the European than off the American coast. Fringing seas, like the North Sea and English Channel, are colder than the Atlantic in winter.

in the water, as the records of the *Valdivia*, given in table on p. 43, will show.

This difference is found at even greater depths. South of the Ridge, temperatures of from 36° F. to 38° F. are found between 2000 and 2025 fathoms; north of the Ridge the *Vöringen* expedition of 1876–78 observed temperatures of 33·9° F. to 34·6° F. at depths ranging from 600 to 2000 fathoms off the southwest coast of Norway. The fact is that cold water fills the hollow in the ocean floor off the west coast of Norway, whilst the water which accumulates in the depths of the northeastern Atlantic is warm.

But above these clearly separated bottom waters lying below 200 or 300 fathoms, the influence of the North Atlantic Drift reigns supreme (see Fig. 12). Unaffected by differences in the temperature of the water beneath it, it flows slowly and irresistibly across the

Wyville-Thomson Ridge towards higher latitudes. The main body of the Drift passes between the Shetlands and Færöes rather than between the Færöes and Iceland, giving the more easterly channel a greater share of the warm, salt water which characterises the Ocean. In the more westerly channel the *Ingolf* observed on August 14th, 1896, a temperature of 40·6° F. and a salinity of 33·22 per mil at a depth of 562 fathoms to the south of the ridge connecting Iceland with the Færöes. Eight days previously, the same ship observed a temperature of 46·8° F. and a salinity of 35·35 per mil at a depth of 550 fathoms in the more easterly channel. Generally speaking, a current some 275–325 fathoms deep and having a mean salinity of 35·33 per mil passes through the more easterly channel between the Shetlands and Færöes. According to the calculations of J. Gehrke, it has a mean velocity of 367 yards an hour and a volume of 14,538 cubic miles. It is by this channel that the Atlantic waters penetrate into the Arctic Sea as well as into the North Sea and, through the Danish straits, even into the Baltic.

The Drift manifests regular seasonal fluctuations which are related to the apparent movements of the sun during the course of the year. From June to November a greater spread of Atlantic water is noticeable in the Arctic and marginal seas of Europe. Its effects are observable in the Bay of Biscay as early as June, on the Newfoundland Banks in July, off the south coast of Ireland in August, in the North Sea during September, and in Barents Sea in November. In winter, between November and May, as the sun migrates southwards, the area covered by Atlantic waters contracts and withdraws towards the southwest before the advance of polar ice and of the influx of fresh water.

The same seasonal contraction and expansion and the same regular changes are observed off the Azores, for the same influences control the movements of the Ocean between the Tropic of Cancer and the Arctic Sea. This is an indication of the close relation between the phenomena of the ocean, the climate, and life in regions far apart. But the regularity of the changes is liable to disturbances which cannot yet be explained. Hydrographers in Sweden and Norway have seemed to recognise in both climate and sea an alternation of mild and cold years, which they are inclined to attribute to variations in the North Atlantic Drift. Other scientists are seeking the cause in cycles which recur after an interval of years and are trying to connect these with the strange regularity with which winter herrings have appeared in the Skagerrak every eleventh year since the 9th century.

2. SEAS ON THE CONTINENTAL SHELF

The North Sea occupies a basin over which the Rhine and its feeders still flowed in quite recent times (see Fig. 10). A slight uplift would raise its southern area above the waves. If the sea bottom were raised 300 feet, Northumberland would be connected with Jutland, and if it were elevated 50 feet there would be dry land between Flamborough Head and Heligoland. On the Dogger Bank the film of water does not exceed 130 feet in depth ; in fact, over an area of 250 square miles it is less than 65 feet, and in the south and southwest the submarine plateau gradually rises to within 50 feet of the surface. The southern edge of the Bank overlooks an east-to-west trough known as the Silver Pits, which has a depth of between 200 and 300 feet and is thought by certain scholars to be part of the old channel of the Rhine. Fishermen's trawls bring up from the floor of the Bank the bones of continental mammals, which lie scattered among river sand and striated pebbles. Northwards from the Dogger Bank the sea bottom slopes away gently from a depth of 130 feet to one of 200 ; then still more gently from 250 to 300 feet and from 300 to 600 feet. The edge of the shelf is reached off the north coast of Scotland, and there is at this point a steep descent to a depth of 550 fathoms.

The smooth regularity of the North Sea bottom is interrupted in its northern end by a striking feature. This is the Norway Deep, a deep, narrow trench with a gentle slope towards the North Sea, but a steep one on the Norwegian side. It cuts its way into the continental shelf off Aalesund and, after following the bend in the coastline of Norway, ends opposite Oslo. After the fashion of a gigantic fjord, it has its greatest depths (between 260 and 430 fathoms) at its inner end, while it grows shallower towards its mouth in the north. This trench has been explained as a channel through which the drainage of the Baltic lands once passed and which was subsequently enlarged by glacial erosion. But in fact its origin remains obscure.

THE BANKS. Northern seamen confine their use of the name North Sea to the wide expanse of water north of a line drawn from the Wash to the Zuider Zee, preferring the term Flemish Sea—or, as English geographers call it, the East Anglian Sea—for the funnel-shaped area which lies south of that line and leads to the Straits of Dover. To this corresponds beyond the Straits the funnel-shaped English Channel. The East Anglian Sea might suitably be named 'the Sea of Banks,' for it owes the main features of its topography to a swarm of sandbanks of a peculiar form. The inequalities in the sandy bottom do not take the shape of wide

platforms like the Dogger Bank or Great Fisher Bank, but of long, narrow ridges arranged in rows or in a fan-pattern. If the sea level

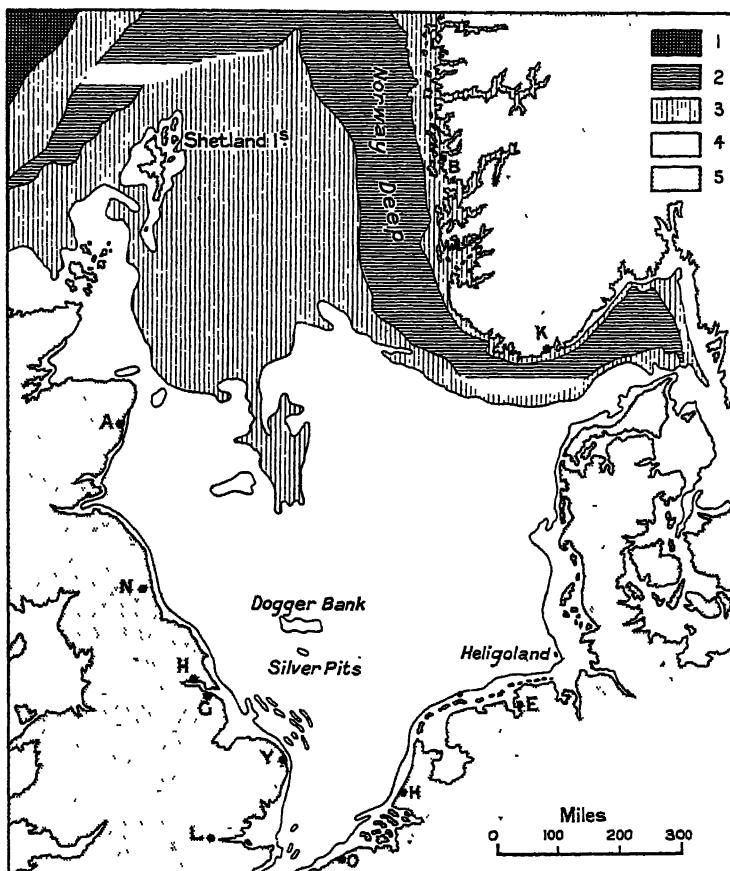


FIG. 13. Relief of the North Sea Floor.

1. Depths greater than 500 fathoms.
2. Depths between 50 and 100 fathoms.
3. Depths between 10 and 50 fathoms.
4. Depths between 0 and 10 fathoms.
5. Land above sea-level.

fell, these ridges would stand up as a series of sandhills looking like huge flat-topped dunes separated by winding valleys. Some of them are ten or fifteen miles long, by one and a quarter miles broad, and 50 to 100 feet high. Off the coast of England between Cromer

and the Dogger Bank there is a line of them, including Dowsing Bank, Haddock Bank, Leman Bank, Ower Bank, and Well Bank. Bank Falls and the Galloper are simple ridges off the mouth of the Thames ; but off the Flemish coast the banks form a group which close in towards the south and open out fanwise towards the north. Off Dunkirk these are succeeded by others which run in almost parallel lines, viz. Bræck, Breedt, Dyck, Ruytingen, and Sandettie.

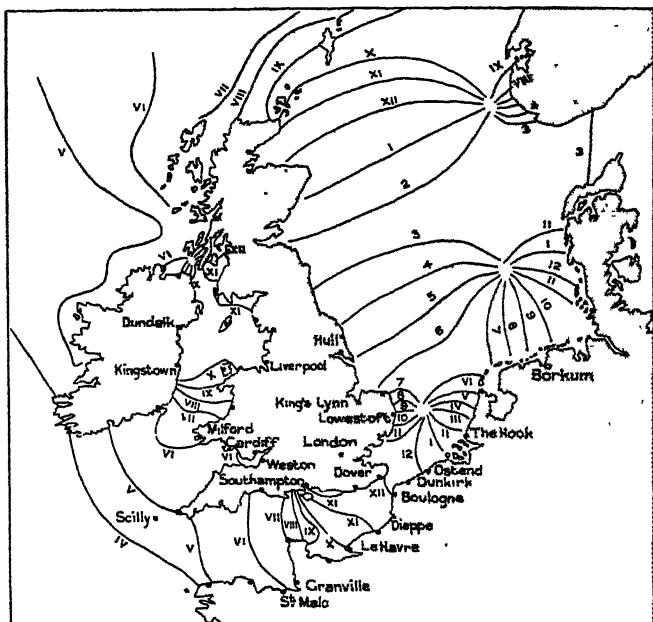


FIG. 14. Co-tidal Lines in the British Seas. Each line joins places which have high tide at the same hour on a given day. Roman numerals mark the hours of one high tide, Arabic figures indicate the previous high tide. The earlier and later tides meet off the mouth of the Thames.

Some of them are covered at low tide by a mere film of water 18 inches deep, but they are separated by troughs 50 to 65 feet deep. Off the coast of Kent an extensive bank, known as the Goodwin Sands, is partially uncovered at low water.

Between Dover and Calais the tidal currents are too strong to allow the formation of sandbanks ; but these soon appear again farther south, where long troughs like Blanc Fond, Creux des Platins, Fond Brun, and Grand Blanc Fond alternate with sandbanks called *bassures* by French sailors and bearing names like Varne, Colbart, Bullock Bank, Bassurelle, Vergoyer, and Bassure

de Baas. They all run southwest-and-northeast, as do the tidal currents. Hence, the tidal currents would seem to be responsible for the submarine topography here. The succession of 'narrow seas' and the string of funnel-shaped basins afford them a strong field of action. Moreover, their influence affects not only the formation of sandbanks and troughs, but also helps, by carrying sand along the bottom of the sea, to furnish the coast with broad beaches and long gentle slopes which gradually deepen seawards. Off Westkapelle on the Isle of Walcheren the isobath for 30 feet passes at a distance of more than five and a half miles from the shore, and this distance increases off Middelkerke to some seven miles.

TIDES. Although tides are scarcely appreciable in the open sea and far from continental margins, they attain to a considerable height and force in shallow waters. As they reach the continental shelf their height increases, and the rising tide swells higher and higher as it meets obstacles on the bottom or shores of the sea (see Fig. 14).

The range of the tides, that is, the vertical difference in level between high and low water, increases towards the inner ends of channels and bays. A normal spring tide, which ranges 16 feet in the relatively open sea around the Scilly Isles, ranges progressively higher as it penetrates into the Bristol Channel. Thus, the range is 27½ feet at Lundy, 38 feet at Cardiff, 39½ feet at Kingsroad at the mouth of the Bristol Avon, and 41 feet at Sharpness. Spring tides rise 20½ feet at London Bridge and 23 feet at King's Lynn on the Wash. In certain circumstances the height of the tide is even greater and exceeds all forecasts; for instance, on February 8th, 1868, the high tide during a storm rose 26½ feet at Leith, which was 4 feet 3 inches higher than usual. The same tidal wave advanced from Aberdeen to Hull in 4 hours 29 minutes at a speed of 92 miles an hour.

The range of the tide is not the same at places situated almost opposite each other on the shores of the same confined waters. Krümmel gives the following figures for places on the coasts of the English Channel:—

	English Coast.		French Coast.
Scilly Isles .	16 feet 0 inches	Ushant .	20 feet 4 inches
Fowey .	15 " 0 "	Ile de Batz .	24 " 11 "
The Needles .	10 " 6 "	Cherbourg .	18 " 0 "
Brighton .	19 " 8 "	Fécamp .	24 " 4 "
Folkestone .	20 " 0 "	Boulogne .	25 " 11 "

The table on p. 49 indicates that the ranges are greater on the southern than on the northern coast. The same contrast is noticed in the Bristol Channel and Irish Sea. At high water the range of the tide is 11 feet 2 inches at Kingstown, but 21 feet at Holyhead ; and between Courtown in Ireland and Cardigan Bay there is a difference of 9 feet 10 inches in favour of the Welsh coast. These irregularities are attributed to the influence of the rotation of the Earth, which deflects the tidal waves to the right.

The rate of diffusion of tidal waves depends on topographical obstacles at the sea bottom and on the shore as well as on distance. When the high tide from the Atlantic reaches the British Isles, it splits into three parts. The first continues northwards, passes round the north of Scotland, and pursues its way to the southern end of the North Sea ; the second enters St. George's Channel and the Irish Sea, where it meets a branch of the first which moves through the North Channel ; the third runs up the English Channel and off the mouth of the Thames meets the tidal wave which has rounded the north of Scotland. At the equinoxes the tidal wave from the north, after it has touched the Irish coast, takes eight hours to reach Aberdeen, nine to reach Leith, fourteen to reach Hull, and twenty to reach London. High tide does not occur everywhere at the same time. As it moves forward, it is progressively delayed. Thus, at full or new moon the tide is at its flood at 4.47 a.m. in the Scilly Isles, but at 11.7 a.m. at Dover ; about 4.6 a.m. at Ushant, but 11.20 a.m. at Boulogne and 12.13 p.m. at Ostend.

It often happens that the tide is rising in one part of a sea, while it is ebbing in another part. It is a commonplace among sailors that when the tide is rising at Liverpool, Dover, Wick, and Heligoland, it is ebbing off Land's End, the southern Hebrides, and the mouth of the Tees, and *vice versa*.

The rate at which tidal currents move varies a great deal. It scarcely exceeds 350 yards an hour on the edge of the Norway Deep and 1400 yards an hour to the northeast of Newcastle. But a rate of two and a half and even three and a half miles an hour has been recorded on Varne Bank. With such rapid currents as these, the dangers to which fishing smacks are exposed will readily be understood. In Blanchard Race, between Cape la Hague and Aurigny, the ebb tide travels at a rate of nine miles an hour, dashing its water tumultuously against the islands and making approach to them difficult. When the straits are narrow passages, the water sometimes rushes through in torrents. The dangerous waters of a race which swirls between Jura and Islay and the Mull of Kintyre are as much feared as the Maelstrom and are known in Gaelic as 'the sea

cauldron.' Rates of ten miles an hour are not infrequent between the Orkneys; whilst the Roost, which passes through the Pentland Firth, rushes along at eleven or twelve miles an hour and is capable of checking the way of big steamers.

Nowhere do tidal phenomena control hydrographic conditions as strongly as in the estuaries. Twice a day the tide causes the picturesque alternation of ebb and flow in the rivers. During the flood a strong current flows upstream and fills the river to the brim. At ebb tide trickles of water find their way through banks of sand and mud, over which sea-birds flit. A sudden increase in the gradient of the river-bed causes a violent encounter between the fresh and salt water, and then the tidal wave roars upstream in a wall of water. This phenomenon is known in the Severn as a *bore* and in the Trent as an *ægir*; in the Seine it is called the *mascaret*.

The smallest estuaries are filled with an enormous quantity of water by the tide. The Humber, for instance, which drains a basin one-thirtieth the size of that of the Danube, contains eleven times as much water in its mouth as the larger river. The Mersey has a basin 722 times smaller than that of the Mississippi, yet at high tide it floats ships which could not enter the southern channel of the American river. Thus, these estuaries all open a waterway inland, and the same tidal current which takes ships upstream brings them down again.

But the current, though an advantage in this way, places obstacles in the path of ships using the estuaries. As the ebb lasts longer than the flow, it is not so powerful; and therefore estuaries are destined to be silted up by sediment which the ebb tide cannot sweep away. But they do not all share the same fate. In some wide estuaries, like those of the Severn, Dee, and Wash, the tidal currents have not been able to prevent silting, and the ports which formerly used them have been left high and dry. But in others, like the Thames, Clyde, and Usk, which are funnel-shaped, the sweeping of the channels is easier. In the bottle-shaped estuary of the Mersey, enormous quantities of water fill the flask portion at flood tide, only to rush back violently at the ebb through the neck, sweeping the channel and maintaining deep water opposite the spot where Liverpool stands.

There are some rather disconcerting phenomena in the movements of the tides in the shallow seas. Sailors have carefully observed them, for they must be taken into account in navigation. The strangest of them occur in the narrow passage, some 420 miles long, which includes the southern part of the North Sea and the northeastern portion of the English Channel, that is, from Start Point and Cotentin in the south to Cromer and the Texel in the

north. As was said before, two tidal waves meet in the southern end of the North Sea, one coming from the Channel, the other moving from Scotland southwards along the coast of England. Off the mouth of the Thames, where they meet, the zone of eddies which they cause gives rise to the formation of innumerable sand-banks, like the Galloper, each of which has had some influence on the growth of ports. At full or new moon the time of high tide is progressively later southwards along the coast of England, whilst on the French and Belgian coasts it is progressively later towards the north. Thus :—

Place.	Time of H.W.O.S.T.	Place.	Time of H.W.O.S.T.
Flamborough Head	4.30 a.m.	Ijmuiden	2.42 p.m.
Grimsby	5.36	The Hook	1.53
Cromer	6.55	Flushing	12.20
Lowestoft	9.41	Ostend	12.13
Orford Ness	10.59	Dunkirk	11.58 a.m.
Gravesend	12.04 p.m.	Calais	11.42

It is clear from this table that two tidal waves meet in the southern end of the North Sea, one coming from the Channel, the other from the north of Scotland. The latter reaches the coast of Kent twelve hours later than the former ; that is, at the same time as the next flood tide from the Channel.

It has been established that the adjacent parts of the North Sea and English Channel form a special area with tidal movements of its own. There are two regions, one in the Channel between Christchurch and Cape la Hague, the other between Yarmouth and the Helder, where the range of the tide is slight, but on the other hand the tidal currents are very strong. In each of these regions the currents flow towards Dover at the moment of flood, and away from it at the moment of ebb ; and, strangely enough, the reversal of direction of these currents does not take place progressively, but simultaneously over the whole length of the two funnel-shaped areas of sea. Observations show that the time when the change occurs coincides with that of high or low tide at Dover. When it is added that even in the Straits of Dover the change of direction of the tidal currents along the shore precedes that of the currents farther seawards by several hours, some idea will be had of the complications imposed by the two great tidal waves on the circulation of water in the channels.

Other anomalies are of local occurrence. Such, for instance, is the phenomenon of double or even thrice repeated high tides

within the space of twelve hours (see Fig. 15). At Christchurch, Poole, and Weymouth there are two high tides ; at Southampton there are three, in consequence of certain features which interfere with tidal movement in the Solent. This circumstance has long been valued because it gives ships an additional three hours of high water. On the Dutch coast there are similar double high tides at the Helder, Zieriksee, and Hellevoetsluis. Havre enjoys advantages

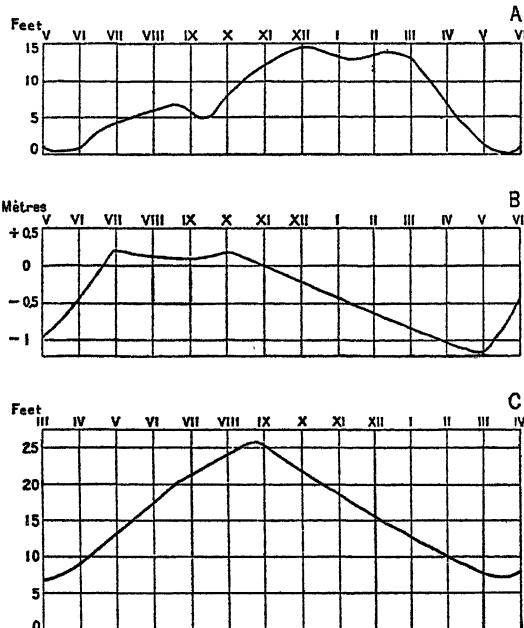


FIG. 15. Graphs showing Mean Variations of the Tide in the course of a Day.

- A. Southampton. Note the triple high tide.
- B. The Helder, where there is a double high tide.
- C. Hull, where there is a single high tide.

The Roman figures denote hours.

much like those of Southampton, for the flood lasts three hours without the level of the water varying more than 16 inches. This prolongs the time which ships have at their disposal for entering or leaving the port.

TEMPERATURE AND SALINITY. The continental nature of the shallow seas is manifested not only in the mighty tides, but also in the temperature and salinity of the water, which is influenced both by the enormous influx of water brought down through the great rivers and by variations in temperature on the adjacent lands.

Over wide areas, and sometimes down to great depths, the waters of the North Sea are of the almost uniform salinity of 34·5 per mil, which is less than that of the Atlantic. The boundaries of the area of uniform salinity run parallel with the coasts at a distance which varies with the quantity of fresh water brought down by the rivers ; that is, about 28 miles off Flamborough Head, 51 miles from the Danish and Norwegian coasts, 93 miles off Heligoland, and between 12 and 24 miles from the coasts of Belgium and the Netherlands. South of latitude 54°, where an intense swirl of the tidal currents takes place throughout the narrow portion of the North Sea, the salinity is constant from the surface to the bottom.

Around this central area of the North Sea runs a belt of coastal water which is affected by influences from the land and has a salinity far below 34 per mil. The main contribution of water from the land issues from the Baltic through the Skagerrak. With a relatively low specific gravity and a salinity of less than 30 per mil, it hugs the coast of Norway, owing to the action of the rotation of the Earth and of the prevailing winds, flowing at a rate of 90 to 110 miles in twenty-four hours. In spite of the prevailing Westerlies, ships have been swept by this current from Oslo to Christiansand. In spring and summer, when it is swelled by rain and melt-water, it fills nearly the whole of the Skagerrak. Advancing along the coast of Norway as far as latitude 62°, it penetrates into the fjords, where it mingles with the waters of the Atlantic and reduces their salinity to 33 per mil. In winter it becomes a mere fringe along the shores of the strait ; for it recoils before the pressure of the saltier and warmer waters of the North Sea, which under the impulse of the west winds occupy the whole breadth of the Skagerrak and reach down to a depth of 100 or 130 feet. The presence of shoals of herrings in the Bohus inlets to the north of Göteborg is explained by the arrival of these waters on the Swedish coast, for the autumn herring lives in this water, which is warmer and saltier than that of the Baltic, and they appear and disappear with it.

The variations in the temperature of the water reflect the influence of the climate of the land. In summer the water is warmer near the coast than farther off shore, and warmer on the Dutch and Belgian coasts than elsewhere in the North Sea. In August the mean temperature rises to 63° F. or 65° F. off the coast of Flanders, as against 58° F. or 59° F. off the coast of Brittany and 52° F. between Scotland and the Shetlands. In August and September the whole of the eastern portion of the Irish Sea, where there are enormous sandbanks that are warmed up by the sun at low tide, has a temperature 2° higher than that of the western portion. On the other hand, in winter the temperature of the water increases from the

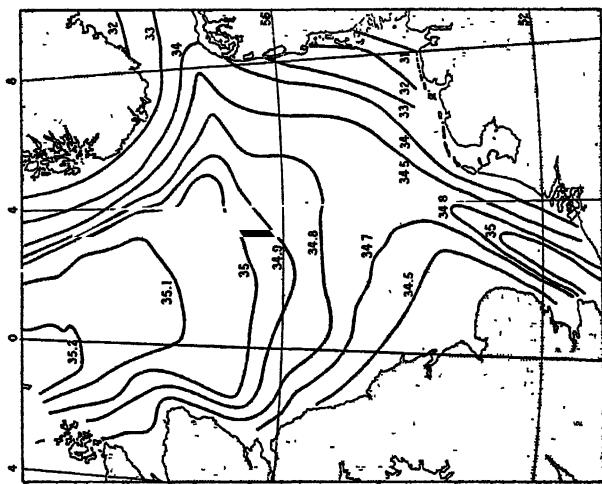
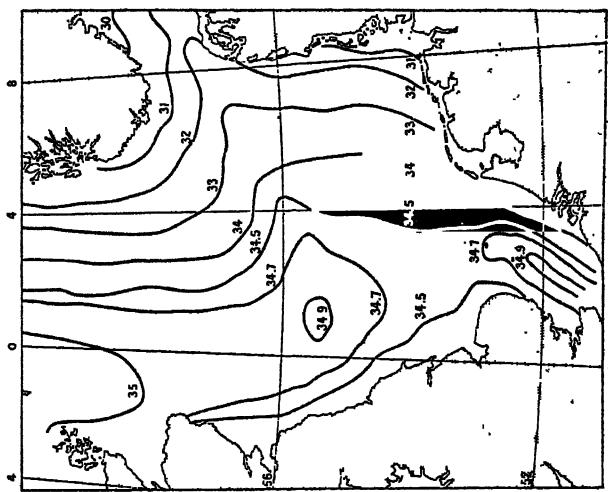


FIG. 16. Salinity of the Surface Waters of the North Sea (1902-1914). (After Böhmecke.) Left, the conditions in February are shown, viz., a high salinity owing to the entry of water from the Atlantic. Right, the change in conditions is due to the withdrawal of Atlantic water from the North Sea.

shore seawards. The annual range reaches its maximum on the shores of the Continent, where it is 23·4° F. on the Dutch and Belgian coasts, as against 9° F. on the west coast of Britain and 7·2° F. around the Shetlands. Hence, the water is coldest in winter and warmest in summer off the eastern shores of the North Sea. The summer warmth fosters the growth of the young flat-fish which swarm in these shallow waters.

The influence of the Ocean can be recognised throughout these marginal seas (see Fig. 16). A huge stream of water from the Atlantic penetrates into the English Channel. Charts showing isohalines indicate an axis of maximum salinity following the middle of the Channel. It has a salinity of 35·4 per mil as far as Long. 4° 30' W. and one of 35·3 per mil as far as Long. 2° 50' W. An extension eastward carries the high salinity of 35·2 per mil right into the Straits of Dover. This encroachment of Atlantic waters seems to undergo the same seasonal fluctuations as the North Atlantic Drift; for instance, in 1903, when water with a high salinity was unusually widespread in the Channel, there was a corresponding occurrence of increased salinity in the Arctic Sea.

The tongue of Atlantic water which enters the Channel penetrates right into the North Sea. Gilson likens the movement of water from the Channel to the North Sea to that of a man taking four paces forward and then four backward, and repeating the action. The net result of the oscillation is positive, for the vast majority of floats thrown into the sea off Ostend are drifted northeastwards. On charts showing the salinity of the water, the isohaline for 35 per mil extends from the Channel as far as the Helder. The influx of salt water from the south exercises a preponderating influence on the hydrography of the North Sea south of Dogger Bank, for this area, which is somewhat isolated from the circulation of the rest of the North Sea, gets its supply of Atlantic water by way of the Channel. It is a significant fact that of the three North Sea areas which show the highest records of salinity, one with a salinity of 35·2 per mil lies off the northeast coast of Scotland, whilst the other two are situated in the southern end of the North Sea. One of these, which has a salinity of 34·75 per mil, is situated to the south of the Dogger Bank, and the other, with a salinity of 35·2 per mil, occurs between Dover and Calais.

At its northern end the North Sea receives its influx of water from the Atlantic through the passage between the Shetlands and Færöes. A vast tongue of relatively warm, salt water, whose position is indicated by the isohaline for 35 per mil, is observed in favourable years as far south as the northern edge of the Great Fisher and Dogger Banks. Its continuity is rather precarious owing to the

[Photo: Preston, Penzance.

B. LAND'S END, CORNWALL

Exposed to the attacks of the waves, this coast has been broken up into rocky headlands, reefs, and islets.

A natural arch appears in the middle-ground. This scene is typical of a coast made of resistant rock,

[Crown Copyright.

A. DUNCANSBY HEAD

The Old Red Sand-stone cliffs rise some 240 feet above the sea. Some old stacks are clearly seen in the middle-ground.

PLATE XII



[Photo: Macfarlane.

A. FISH LAID OUT TO DRY ON TRESTLES AT ABERDEEN



[Photo: Valentine.

B. GUTTING AND CLEANING OF HERRING AT STORNOWAY

action of currents ; but in warm, calm summer weather it occupies an area which becomes greater as the northwest winds grow stronger. When the wind blows from the east or southeast, the stream withdraws towards the coast of Scotland and disappears under the layers of fresher water which are driven from off the shores of the Continent.

The researches of Scandinavian investigators show that the great seasonal fluctuations in the tongue of Atlantic water seem to affect the waters off the Germanic countries as well as those off the English or French coasts. An extension of the tongue has been observed right in the Skagerrak. Reaching its maximum in November, it moves forward under an upper layer of fresher water 200 feet deep. It reaches the Baltic through the Kattegat and shows signs of its presence as far east as Bornholm. The same phase of encroachment, accompanied by a great migration of cod and haddock in the neighbourhood of the North Cape, is observed towards the end of the year in the Barents Sea, for all the marginal seas share in the chief movements of the Atlantic. Often it is a mere attenuated and belated echo that reaches them ; but the foregoing account is enough to prove that none of the seas are completely isolated from the Ocean and that their most distant parts are affected by the working of the mechanism of the Atlantic.

3. ANIMAL LIFE IN THE MARGINAL SEAS

The zone of contact between the influence of the Ocean and that of the land forms the habitat of a fauna rich in fishes. It comprises areas as far apart as the North Sea and Barents Sea on the one hand and Iceland and the Skagerrak on the other. It is inhabited by extraordinarily prolific species, which swarm on the sea bottom and move about in enormous shoals. It is the home of the herring, cod, haddock, plaice, and other species, which are caught in vast numbers. The region is marked by certain hydrographic characteristics, namely great seasonal variations in temperature and salinity, with high temperatures in summer ; the temperature of the water seldom falls below 32° F. and over wide areas remains above 43° F. Murray and Hjort have named it the Boreal Region, and include within it the open sea off the west coast of Norway, the coastal waters of Norway as far north as the North Cape, the North Sea together with the Skagerrak and Kattegat, and the neighbourhood of the Færöes and Iceland.

To the southwest of this lies another region which is warmer. Here the hake (*Gadus merluccius*) forms 35 per cent. of the catch of bottom fish off the southwest of England, and this percentage rises to 65 in the Bay of Biscay. The pilchard, a denizen of the

Atlantic, is found off the Cornish coast, but does not penetrate far into the colder waters of the eastern parts of the English Channel. The herring scarcely goes farther south than Brittany and appears but irregularly off the whole of the west coast of the British Isles. The cod gradually disappears towards the south. It forms 81 per cent. of the catch off the coast of Norway, 60 per cent. in Iceland, 48 per cent. off the Færöes, but only 45 per cent. at the southern end of the English Channel. Thus, the Boreal Region ends at the warmer waters off the shores of southern Ireland and Cornwall and of the western end of the English Channel.

THE NATURE OF THE FAUNA IN THE BOREAL REGION. The boreal waters, and especially those of the North Sea, are characterised by an astonishing wealth of animal life. Certain species found in it have a prodigious fertility. Plankton, which is a mass of living matter with microscopic elements providing fish-food, abounds in regions consisting of waters of different provenance, viz., on the margins of currents and in zones of contact between warm and cold water, where a great range of temperature is manifested in the surface waters. The regions of the northern hemisphere in which the range of temperature of the sea water exceeds 30° F. have become famous for their fishing grounds ; namely, the seas around Japan from Sakhalin to Formosa (Taiwan), the Atlantic off the coast of the New England States, the area to the south and south-east of Newfoundland, and the seas of Western Europe, including the Baltic, the eastern end of the English Channel, and the North Sea from the Humber to Lindesnes. In these marginal seas there are other sources of food-supply in the form of organic matter brought down from the land by rivers and refuse yielded by the luxuriant vegetation of ground-algæ. Besides, the ceaseless renewal of these vast supplies is favoured by hydrographic conditions, namely the constant circulation of the water, the currents, and the storms which ensure the penetration of air and light into the surface layers and foster vegetable life and microscopic organisms. The *Michael Sars* found the deep layers of water poorer in vegetable plankton. The maximum amount was collected at a depth of 160 feet, but at a depth of 330 feet this amount had fallen off by a tenth.

These areas have been likened to inexhaustible and luxuriant pastures. They are so densely populated with plants and animals that they even derive their colour from them. The green of the English Channel, the North Sea, and Baltic, which are all rich in plankton, contrasts with the beautiful, transparent blue of the tropical waters of the Atlantic. Attempts have been made to measure the incommensurable exuberance of life. According to Hensen and Brandt, every square yard of the Baltic yields on the

average 2000 grains of solid nutritive matter in the form of plankton. One diatom (*Chætoceros*) is so abundant in the western part of the Sea that a cubic yard of water contains more than 349 billions of these tiny plants. Similarly, the fish reproduce in prodigious swarms. Every female turbot lays on an average 8,600,000 eggs ; the cod lays 4,500,000, the sole 570,000, the herring 31,000. At this rate of reproduction, the floor of the North Sea, as Möbius has said, offers man harvests a great deal richer than the sandy areas and wastes that often exist in flood plains.

A knowledge of the natural laws which regulate this exuberance of life is even more important to man than the wealth of the fishing-grounds. Mention has been made above of the periodic variations which occur in the temperature and salinity of the water and in the quantity and nature of the plankton, and of the sudden appearances of fish in certain places. Is there any connexion between the hydrographic conditions and the biological phenomena ? Is there any prospect of discovering in the laws which govern the sea those which regulate the occurrence of fish ? Scientific research has not yet solved the mystery. Though certain relations have been established, the chain of cause and effect has still to be discovered, and it is thus all the more difficult to ascertain whether the movements of the fish depend on instincts proper to each species and even to each variety—that is to say, on causes which are still unknown. Hence, there is as yet no explanation of the uncertainties, irregularities, and vicissitudes in the fishing conditions, which have frequently during the course of history affected the fortunes of many North Sea towns.

THE CHIEF KINDS OF FISH. It is usual to divide fish into two main classes : pelagic and bottom fish. Pelagic fish are found out to sea not far from the surface, although they may be met with at all depths according to the period of their life. When they swarm together periodically in enormous shoals to spawn, they are caught at the intermediate depths. Mackerel and, more especially, herring provide the most remarkable instances of this. Bottom fish live quite near to or actually on the bottom of the sea. They are round fish, like the cod, or flat fish, like the plaice, sole, or turbot.

For centuries nothing was known about the life of the herring, except the annual episode of spawning. It appears suddenly off the coast in multitudinous shoals, from which the nets bring in astonishingly large catches. Fishing smacks have been known to take 700,000 herrings in at a single haul. Sometimes a shoal of herrings extends for 90 or 125 miles. The fish come to within 65 or 125 feet of the surface, chiefly at night, and they are caught in drift-

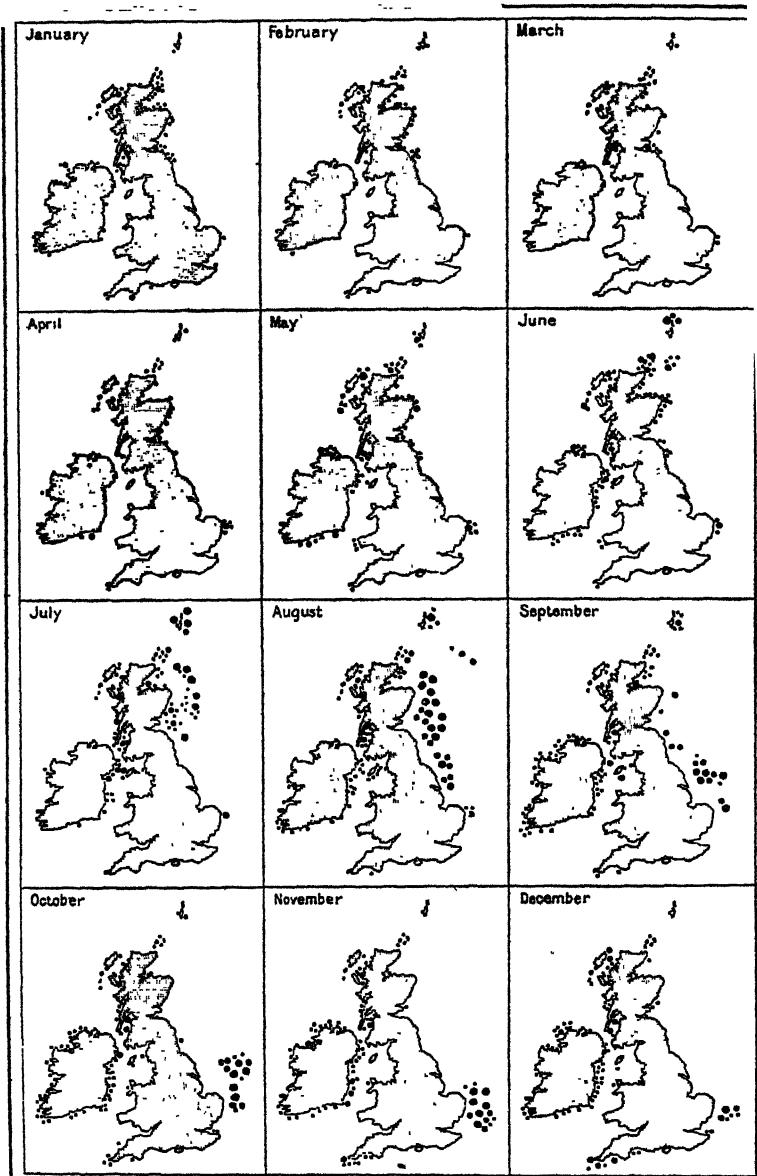


FIG. 17. Fishing Grounds and Seasons of the British Herring Fishery. (After the *Bulletin Statistique des Pêches Maritimes*.) The volume of the catch is proportionate to the size of the dots. Note that the main fishing area moves south between June and November.

nets placed across their course. As all the females do not spawn at the same time, the shoal remains in the neighbourhood of its spawning-ground for a month or two. Consequently, the fishing season lasts that time. Then the shoal disappears suddenly and is not seen again till the following year. The life of the fisherman is regulated by this periodicity. It was long a mystery what became of the herring in the intervals between the fishing seasons, and it was supposed that they migrated to great distances. But, in fact, they do not leave the seas in which their spawning-grounds lie : they merely move to greater depths.

Hence, the old theory that the herring came from the Atlantic in a great annual migration, like an army marching by successive stages, must be abandoned. The truth is that all these shoals of herring which regularly appear at different times belong to local varieties which differ in appearance, shape, anatomy, spawning season, and spawning-grounds. Three main varieties of herring have been recognised in the North Sea. The Dogger Bank herring, which is caught off the east coast of England and on the Dogger Bank, is small, being only $9\frac{1}{2}$ to 10 inches long, and it spawns in August. The Shetland herring, which is 12 inches long, spawns in July and August ; whilst the Norwegian herring, which is still bigger, spawns in spring.

Of all the fishing-grounds in northwestern Europe, the east coast of Britain is visited most regularly by shoals of herring (see Fig. 17). Elsewhere the fish seem to come more irregularly and capriciously. The true home of the herring, the haunt which it has never deserted and which for centuries it has visited periodically in summer and autumn, is the western area of the North Sea along the shores of Britain. Its appearance may be followed by observing the movements of the fishing fleets which go out to catch the fish. In June and July they will be seen manoeuvring near the Orkneys and Shetlands ; in August and September off the coasts of Scotland and England almost as far south as the Humber ; from September to the end of November off Yarmouth and Lowestoft. These positions mark the fishing-grounds which have made the fortunes of the British and Dutch fishermen.

The mackerel, a pelagic fish like the herring, appears in shoals near the coasts at the spawning season from spring to autumn. It was formerly thought to spend the winter in the Atlantic ; but it is now known to remain all the year round in a special locality, each locality having its own species or variety. But it is a southern fish and appears on its more northerly and easterly spawning-grounds progressively later, as the warmth of the sun increases. By January it is being caught off the Cornish coast, but the season

does not reach its height off the southwest of the British Isles till March and June. It lasts from June to August in the Irish Sea, from May to June and also from September to October off Lowestoft; and from June to September off the coasts of Scandinavia. In the winter months of January and February mackerel are caught only in the western end of the English Channel.

Of all the bottom fish the cod is the commonest and most important from the economic point of view. It is found in large numbers throughout the North Sea at all seasons. Unlike the Lofoten cod, which appears in March, April, and May, and the Icelandic cod, which is caught in summer only, the North Sea cod is caught nearly all the year round. Hence, cod-fishing has long been the necessary complement of seasonal fishing for herring and mackerel. Its true home is off the coast of Norfolk and above all on the Dogger Bank (*Dogger* = 'cod' in Dutch).

Bottom fish prefer shallow water which is affected by variations in air temperature and reached by the direct rays of the sun. In this zone, which is hardly ever deeper than 130 feet, live the sole, turbot, plaice, dab, flounder, and brill. In winter many of these fish, which are very sensitive to cold, collect in the deeper hollows, like the Yorkshire Hole and the Silver Pits, where variations in temperature do not affect them. Fishermen still remember the discovery of the Silver Pits, then an unexplored trough, from which the nets brought up a fabulous number of huge sole. The Bay of Liverpool swarms with sole and plaice. In the English Channel conditions are not so good, and trawling-grounds occur only at intervals off the Eddystone Lighthouse, Brixham, and Hastings, as well as off the mouth of the Seine. But the special haunt of these fish is in the eastern and southern parts of the North Sea, which resemble a gigantic fish-pond and have long been exploited by trawlers without becoming exhausted. The richest areas are known as the Easter Grounds and lie off the coasts of the Netherlands, Germany, and Denmark. Large dab and turbot abound in them. For a long time the London market was supplied with turbot exclusively by Dutch fishermen. Sole and plaice are hatched in vast numbers in the Heligoland Bight, whence they emigrate later to people the other trawling-grounds farther south in the North Sea.

FISHERIES. Owing to the amazing productivity of its waters, the North Sea holds a prominent place in man's economic system, for its fishing industry has been the cause of the maritime life of the people who dwell on its shores. The fishing craft which normally frequent it may be estimated at more than 30,000, of which two-thirds are British. Their types vary according to sailing conditions

and the character of the people. Some are little boats which do not go far from the shore and which return to port nearly every evening. For instance, there are the motor well-boats which drag the *snurvaad* over the shallows of the Danish coast ; *bomschuitten* or flat-bottomed boats used in the Dutch estuaries ; undecked boats used in the Norwegian fjords ; little sailing trawlers from Boulogne and Ostend, herring-smacks, and line fishing-boats from all the countries around. There are also large ships fitted out for long voyages, such as luggers and sailing dundees, which catch and salt herring ; steam herring-boats or drifters ; and steam trawlers. The tendency is for larger and better equipped boats to replace the older and smaller types. Four-fifths of the larger boats are British.

At the height of the fishing season certain areas in the North Sea bear floating towns full of eager, swarming men belonging to many nations. Sometimes boats of several nations cast their nets into the same shoal of herring. From these rival interests have sprung international laws. It has been necessary to define the boundaries of territorial waters. For every country, except Norway, this has been fixed at a distance of three miles from the foreshore. It has been necessary, too, to anticipate disputes over lost or tangled nets and collisions between boats, to organise the supervision, policing, and hygiene of these temporary towns. Formerly, special boats, called 'coopers' or 'bumboats,' went round the fishing fleets selling tobacco, victuals, and alcohol ; but after the international conference at the Hague in 1886 this unwholesome traffic was forbidden.

With the British craft are mission ships which ensure medical attention and opportunities for religious services. Before the war of 1939-45 more than 130,000 men— i.e., the population of a large town—were employed on the fishing boats. Of these 35,000 were English, 40,000 Scottish, 20,000 German, 20,000 Dutch, 8000 Norwegian, 7000 Danish, 3000 Belgian, and 2000 French. To those who manned the boats must be added those who worked ashore salting and smoking the fish, making barrels and nets, building boats, and selling the fish. In Britain alone the total number of workers was about 250,000 persons. If the workers' families are included, it means that nearly a million people depended on fishing for their daily bread. Since the end of the war there has been a return to normal conditions ; but with the gradual increase in the size of the boats, the number of persons employed will decrease. On the coasts large towns, like Yarmouth, Lowestoft, Grimsby, Hull, Aberdeen, Peterhead, Bergen, Christiansand, Geestemünde, IJmuiden, and Ostend, owe their origin and fortunes to fishing (see Plate XII).

Of the total selling price of the North Sea catch, England usually takes 43 per cent., Scotland 17, Norway 13, the Netherlands 9, Germany 8, Denmark 4, and Belgium 1.5. The herring counts for 29 per cent. in the aggregate value of the catch, the cod for 15, the haddock for 12, the plaice for 8, the sole for 3, and the mackerel for 3. It is calculated that the quantity of fish caught amounts to 2800 tons a day and 1,000,000 tons a year. Finally, when the yield of the various seas is compared, it is found that the fishing-grounds of the English Channel and the Atlantic give 29.9 cwt. of fish for every square mile of surface, the Mediterranean 19.5 cwt., and the North Sea 182 cwt.¹

¹ The figures given in this paragraph were those for the years prior to 1939, and may be regarded as normal. During the war the requisitioning of many of the larger fishing vessels and the calling-up of most of the younger fishermen for service with the Royal Navy, caused the annual catch to be reduced to one-quarter of its former quantity. The fact that the North Sea and Norwegian fishing grounds could not be used was another factor, which also caused the relative quantities of the different fish to be greatly changed. Thus, in 1944 cod formed 30 per cent. of the total quantity of the catch, plaice 10 per cent, haddock 5, sole 5, and herrings only 3.7 per cent.

CHAPTER III

CLIMATE AND VEGETATION OF THE NORTH SEA COUNTRIES

THE British Isles, together with the countries on the mainland opposite, belong to a major climatic region which embraces nearly all Western Europe. This climate is dominated by the influence of the Atlantic and is distinguished by its maritime character from the continental climate which becomes more and more evident towards Central and Eastern Europe. From Norway to Spanish Galicia the influence of the sea associates countries which are separated by many degrees of latitude and which include Denmark, North Germany, the Netherlands, Belgium, the British Isles, and western France.

1. PRESSURE AND WIND

The factors which control the climate of Western Europe must be sought outside the region. The circulation of the atmosphere depends on two main centres of energy which are permanently established over the Atlantic. One is an anti-cyclonic, or high pressure, area over the Azores ; the other is a cyclonic, or low pressure, area, which is situated over Iceland. Between the two centres exists a system of prevailing westerly winds, which form the basic feature of the climate, since they bring into the region the warm, moist air from over the sea. In Western Europe winds with a westerly component form 60 per cent. of those that blow in summer and 53 per cent. of those in winter. They have an annual frequency of 62 per cent. in Dublin, 56 per cent. in Edinburgh, 64 per cent. in Utrecht, and 58 per cent. in Brussels.

The predominant influence of the Atlantic extends far into the northeast, where it is maintained not only by the Icelandic low pressure system which sometimes spreads right into the Arctic, but also by the great stream of warm water of the North Atlantic Drift. Bringing with it both warmth and humidity, the wind from over the Ocean gives the countries over which it blows a climate that is milder than the latitude warrants. The coast of Norway is free from ice throughout the year, yet it is in the same latitude as the frozen shores of Greenland ; and the wastes of Labrador lie opposite the fertile plains of England and the Netherlands.

Within this general scheme each season has its own special conditions (see Figs. 18 and 19). In winter the Icelandic low pressure centre is deep and widespread, and the barometric gradient—or difference between the pressure maximum at the Azores and the minimum over Iceland—attains its greatest value. Hence, the warm, moist air which travels across the Atlantic moves with its greatest force and is accompanied by internal disturbances, squalls, and storms. This is the maximum period of precipitation, when, in October especially, rain is almost incessant, and the land is shrouded

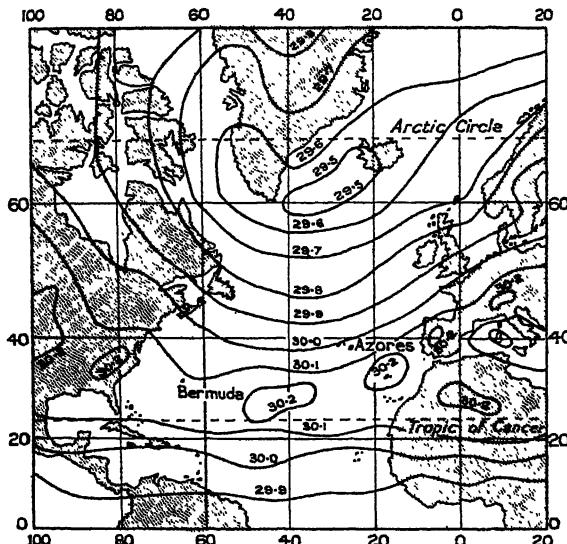


FIG. 18. Barometric Pressure over the North Atlantic in January.
(After Bartholomew.) The pressure is shown in inches.

in low clouds which drip continually. At this period too the streams are in spate, and floods occur.

But there is another factor which operates in winter, namely, the influence of the Eurasian continent, over which pressure is high at this season owing to the accumulation of masses of cold, heavy air. At this time the continental area contrasts strongly with the maritime region, the former being cold, dry, with fairly steady weather, and losing much of its warmth through radiation; whilst the latter is unsteady, warm, moist, has changeable weather, and is covered with a layer of air which is full of water vapour and readily heated.

On the margins of the two regions a continual struggle rages.

Slow movements occur when one region advances and the other retreats, and the areas over which these oscillations take place are influenced now by one, now by the other. When the continental high pressure advances westwards, it brings with it dry, clear, cold weather. The great periods of frost which have been conspicuous in history for their disastrous effects in this mild, damp region have been caused by the persistence of one of these wintry invasions of high pressure. The frost which lasted uninterruptedly over southeastern England from November 25th, 1890, to January 22nd,

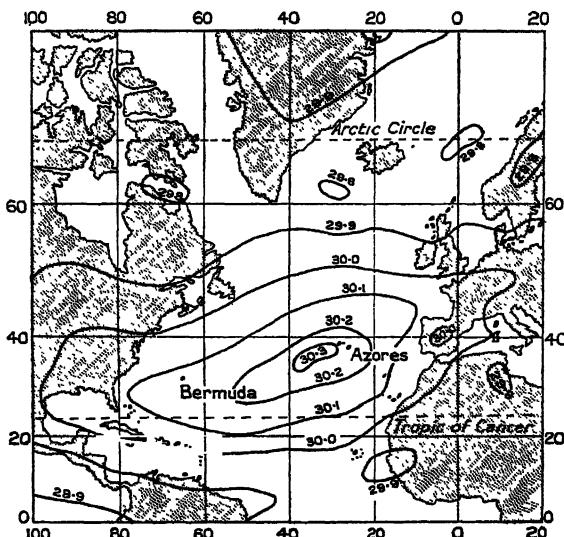


FIG. 19. Barometric Pressure over the North Atlantic in July.
(After Bartholomew.) The pressure is shown in inches.

1891, was an example. The whole of the east of England as well as Belgium and the Netherlands is far more exposed to these periods of intense cold than the northwest of the British Isles, since the latter lies well within the Atlantic sphere of influence. On the other hand, when the influence of the sea advances eastwards the winters remain mild and rainy in the countries bordering on the North Sea.

In summer the Icelandic depression is not as deep as it is in winter; the Azores high pressure centre moves northwards with the sun and takes up a position nearly due west of Europe; and, lastly, the overheated continent of Eurasia becomes a centre of low pressure, towards which blow winds from the Atlantic. It is at this time especially that westerly winds prevail over the British

Isles, giving Scotland and Ireland their cool, wet summers. As the differences in pressure are relatively small, atmospheric circulation takes place without disturbances or stormy weather, and almost without force.

These seasonal conditions do not give a complete idea of the facts. Considered by themselves, they might suggest a kind of regular periodicity in the climatic phenomena, whilst on the contrary the peculiarity of the maritime climate lies in its extreme variability. This instability is due to storms connected with low pressure disturbances. The latter are movements of the atmosphere which are accompanied by barometric depression and take their rise mainly at the point of contact of the warm damp streams of tropical air and cold air currents from the polar region. They form the predominant feature of atmospheric circulation over the Atlantic, which, being warmer latitude for latitude than the Pacific, is *par excellence* the ocean of low pressure disturbances. These reach their maximum frequency in winter, when the difference in temperature between the warm current and the adjacent water is greatest and the wind attains its greatest volume and force. The frequency increases from a minimum in June and July to a maximum in January. The low pressure disturbances move eastwards to the coast of Europe, usually passing along the northern shores of the British Isles. Hence, barometric pressure is always lower in the north than in the south of the islands, and the weather is steadier and more settled in the south, but changeable and unstable in the north.

The passage of low pressure disturbances has a profound effect on the climate of Western Europe. Astonishing changes of weather from one day to the next and even during the course of the same day, abrupt variations in temperature at a given point, and remarkable differences which occur at a particular moment in places quite near together are familiar features of the climate of the British Isles and the Netherlands. A low pressure disturbance which moves from west to east or from southwest to northeast over the British Isles causes warm, moist winds as it approaches, but cold, dry winds when it has passed. Thus, on December 8th and 9th, 1872, the temperature rose in front of a disturbance to 50° F. in the south of Ireland, in England, and in France, but fell to freezing point in the same area a few hours after the passage of the disturbance. Low pressure disturbances often spring up with extraordinary force. On January 20th, 1884, the barometer fell 1·13 inches in four hours at Stornoway, and on the same day it fell to 27·34 inches near Greenock. These enormous variations in pressure give rise to terrible storms on the coasts of the British Isles, and even cause

shipwrecks and other disasters like the destruction of the Tay Bridge.

The low pressure disturbances are a decisive factor in the rainfall system. If Western Europe received only the normal precipitation from the Atlantic Drift, rain would fall only when the air from over the current was chilled by contact with the mountains or the cold northern regions, and the clouds would pass over the lowlands without farther condensation. ‘The intervention of the low pressure disturbances,’ writes Duclaux, ‘changes this distribution. By causing rain to fall by means of a mechanism within the air-current and consequently independent of the external influences of locality, they ensure a more even distribution of rain in the path of the winds, even though this distribution is also quite irregular and independent of local circumstances.’ Within the depression the warm damp air in the lower strata comes into contact with the cold upper air, thus giving rise to stormy, overcast skies and to those sudden squalls which give the winters in Scotland their wild, fantastic character.

To complete the picture of the abrupt changes caused by low pressure disturbances in the climate of Western Europe, it should be added that the paths followed by the depressions over the Atlantic Drift constantly vary. They approach Europe most frequently by way of Ireland and Scotland; but sometimes they move over Cornwall, the English Channel, and the Bay of Biscay, or else over Scandinavia and the Arctic Sea. Hence, the possible developments and changes that may occur are astonishingly complicated and depend on the point at which the depressions reach the land and on the time of the year. When the depressions come up from the west in winter, they lower the temperature for a while and bring snow, whilst in summer they cause thunderstorms. When they come from the north, they increase the severity of the cold. In spring they give cold, dry weather with night frosts which nip the half-opened buds.

2. TEMPERATURE

The influence of the sea winds affects the temperature curve throughout the year in the maritime region. In the first place, it lessens the variations in temperature, moderating alike the heat of summer and the cold of winter. The annual range, that is, the difference between the warmest and the coldest months, is as high as 36° F. at Strasbourg and 28·6° F. in Paris, but is only 23·8° F. at Kew, 18° F. at Dublin, and 14·6° F. at Valentia. The mean January temperature, which is 42° F. at Cork, falls to 31° F. in Berlin and 22° F. in Warsaw; in Aberdeen it is 38° F., but at

Nain in Labrador it is — 7.1° F. Yet all these places are in corresponding latitudes. The most typical example of this balanced, equable climate is found on the coasts and islands of western Scotland. There the warmth of the summer sun is almost too feeble to ripen the grain crops ; whilst in winter there are fogs and drizzle, but no frost or great cold ; little snow, except on the mountains ; and the rivers are never frozen over. Seasonal variations in temperature

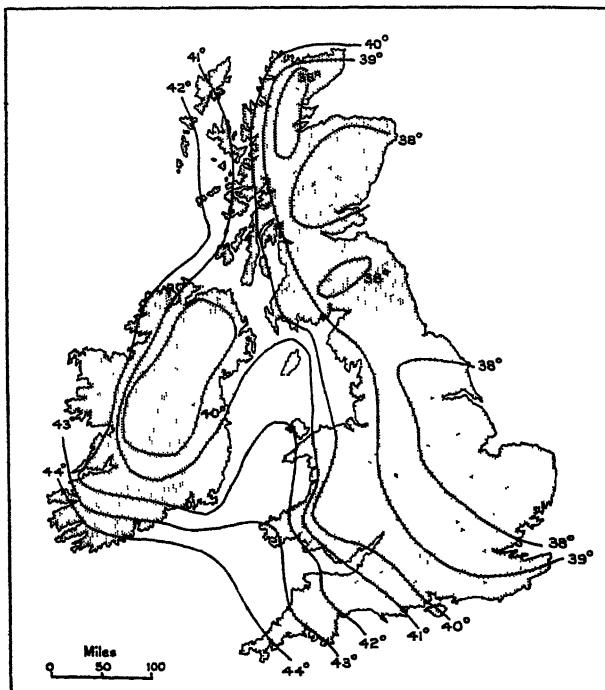


FIG. 20. January Isotherms in the British Isles. (After Bartholomew.) The north-south direction of the lines betrays the influence of the Atlantic. The coldest areas occur inland and on the east coast.

are less than in the more continental regions of the southeast; thus, in London the difference between the means for the warmest and coldest months is 23° F., whilst at Thurso it is barely 14° F.

The mildness of the winters is a characteristic feature of the maritime climate. On a temperature chart the isotherm for 32° F. sweeps round in a long curve up to the latitude of the North Cape, enclosing the British Isles as if in a gulf of warm water. Owing to the release of warmth from the Atlantic, the winters remain particularly mild. Thus, in January Devon and the

Isle of Wight enjoy a mean temperature which is as high as that of Riva on Lake Garda, Jersey has one equal to that of Fiume, and Barnstaple to that of Pau ; whilst on the west coast of Ireland the winter is no more severe than at Naples. Moreover, under the influence of the southwesterly winds from over the Atlantic a curious inversion of temperature is noticed along the west coast of the British Isles, for the monthly means increase from south to north. Thus, the mean for the coolest month is 42° F. at Bordeaux, 46° F. at Brest, 49° F. in the Scilly Isles, 48° F. at Valentia, and 43° F. in the Hebrides. That is, the Hebrides have a milder winter than Bordeaux.

The mild character of the winter is reflected in the life of the countryside. The work in the fields is not interrupted by long periods of frost, as it is in Central Europe, and outdoor occupations are possible far into the autumn. Owing to this, the Flemish peasant can use his land for those late extra crops which led him on to the discovery of the modern principle of rotation. Animals leave the byre at an early season in this temperate climate and stay in the fields without being harmed by the cold. In the Netherlands cows are driven out to pasture in the middle of April and stay out day and night till November. In the Frisian Islands the animals are driven out at the beginning of May. In several parts of the British Isles cattle spend the whole winter out of doors.

Ice and snow do not last long in such mild winters. At Greenwich the average number of days on which snow falls during the year is fourteen, though in some years this amount is exceeded. In the southwest of England and the west of Ireland snow seldom lies for more than a day. In Edinburgh there is snow on twenty-one days on the average, though it is sometimes more frequent, as it was in 1872, when there was snow on forty-seven days ; and it is sometimes less frequent, as it was in 1856, when there was snow on three days only. In Brussels the winter of 1907, when skating on natural ice was possible for two weeks, was regarded as exceptional. Even in the Netherlands there are few days of frost. At Groningen and Leeuwarden the number of such days is only half that in East Prussia. The harbours of Terneuzen, Flushing, and Rotterdam escaped being frozen over even in such severe winters as that of 1890-91. 'In the west of the Netherlands,' says Élisée Reclus, 'inland water is seldom frozen over thickly for several days on end, and charming scenes of sleighing and skating on the ice are less frequent than would be supposed from the large number of pictures representing them in museums.'

The influence of the Atlantic is the main factor in climatic differentiation, and in winter it over-rides the influence of latitude.

A traveller passing at this season from Cornwall to the Shetlands notices no great change. St. Kilda has the same mean temperature as Penzance, and Cape Wrath as the Isle of Wight. The January mean is 38.7° F. at Cambridge and 37.6° F. at Thurso. Hence, the isotherms run north and south, showing a decrease in the temperature eastwards (see Fig. 20). The real significance lies between the more maritime and more continental situations, between districts

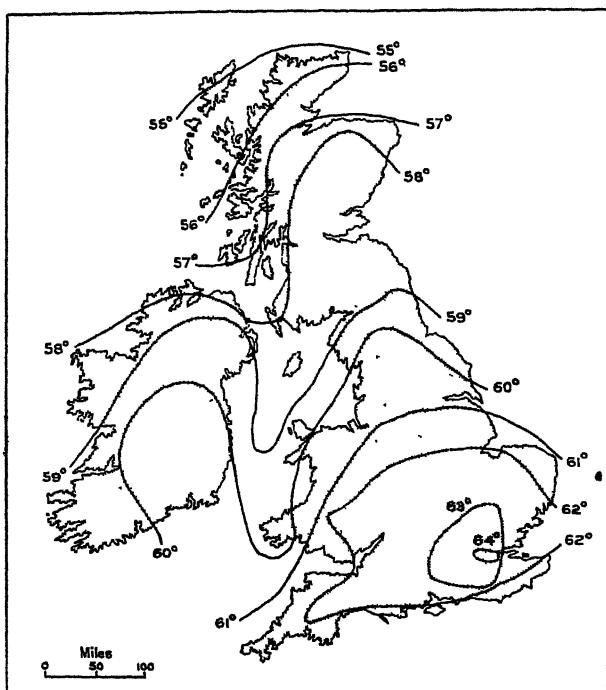


FIG. 21. July Isotherms in the British Isles. (After Bartholomew.) In this diagram the influence of latitude has reasserted itself, though on the whole the east coast is warmer than the west.

in the east and those in the west. In the British Isles the typical maritime climate prevails only in Ireland and the west of Britain. The whole of southeastern England comes under a variety of the continental climate. High temperatures occur there in summer ; for instance, at Thwaite in Suffolk the thermometer registered 86° F. in the shade and 109.4° F. in the sun on May 17th, 1883, and pigs died from the heat when being driven to market at Botesdale. Similarly, in winter intense frost sometimes prevails : the winter of

1813-14 was so severe in the south of England that the Thames was frozen over.

The same differences between the east and west are noticed in Scotland, Ireland, and on the Continent. In the Netherlands the west is more maritime, the east more continental ; for example, the maximum summer temperature rises to 98° F. at Winterswijk and Maestricht on the German frontier, but does not exceed 88° F. at Flushing and the Helder. In winter it is the reverse : the number of days of frost decreases from 80 at Winterswijk to 42 at the Helder and 31 at Flushing. The mean annual temperature is 63·1° F. at Assen on the plateau of Drente and 59·4° F. at the Helder.

In Belgium we again find the same contrast between the coast and the interior. Near the sea there are milder winters, with a winter mean of 36·6° F., cooler summers with a mean of 61·3° F. ; and fifty days of frost occur. Inland on the Campine there are cold winters with a mean of 33·6° F., hot summers with a mean of 62·8° F., and ninety days of frost. The date of the first frost is later near the sea ; at Bastogne in the Ardennes it occurs on October 5th, but at Brussels on November 10th, and at Ostend not till November 16th. Owing to the coolness of the summers, the harvest on the Maritime Plain of Flanders is about ten days later than in Brabant, which is less cloudy and sunnier. Massart has pointed out that the mildness of the winters allows certain plants to grow on the coast, but that these disappear towards the interior. In Belgium *Phleum arenarium* and *Asparagus officinalis*, which are proper to the Mediterranean region, are found only on the coastal dunes, and the larch (*Larix decidua*) flourishes in Flanders alone, being unable to stand the spring frosts which occur in other parts of the country.

3. RAINFALL

In its system and distribution the rainfall reflects the influence of the Atlantic with almost the same fidelity as the temperature does (see Fig. 24). In all the countries bordering on the North Sea and Atlantic, the seasons of greatest rainfall are autumn and winter ; that is, the period when low pressure disturbances are most frequent. A rainfall maximum during the cold season, usually in October, characterises the whole Atlantic seaboard of Europe from Lat. 30° N. to Lat. 70° N. It is manifested both by an abundant precipitation and a large number of rainy days. It controls the drainage system, for the volume of the streams is at its maximum at this time. The driest months (March, April, May) coincide with the slowing down of the passage of low pressure disturbances and with an increase in the frequency of north and northeasterly winds.

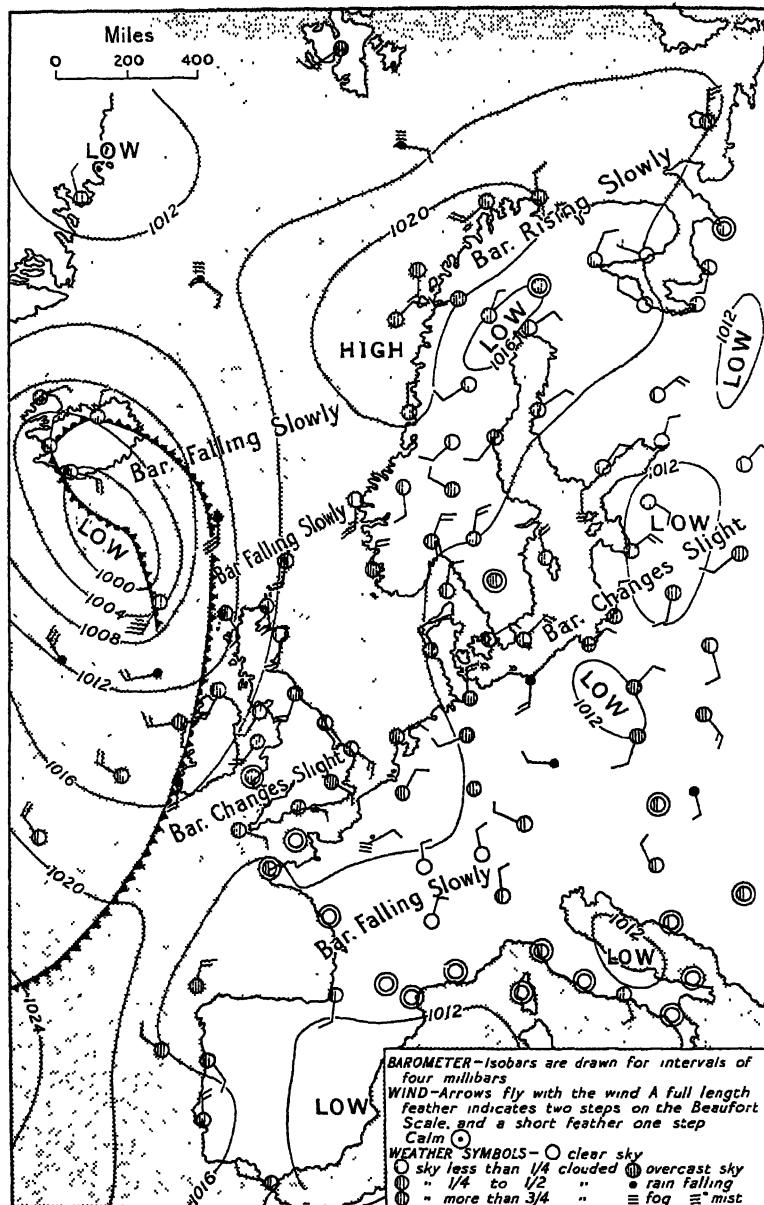


FIG. 22A. A Ridge of High Pressure over Western Europe. Conditions at 7 a.m. G.M.T. on July 22, 1938. The corresponding temperatures are given in Fig. 21B. The dark, edged line marks an occluded front off the west coast of Ireland. In Britain light southerly winds and overcast skies accompanied these conditions.

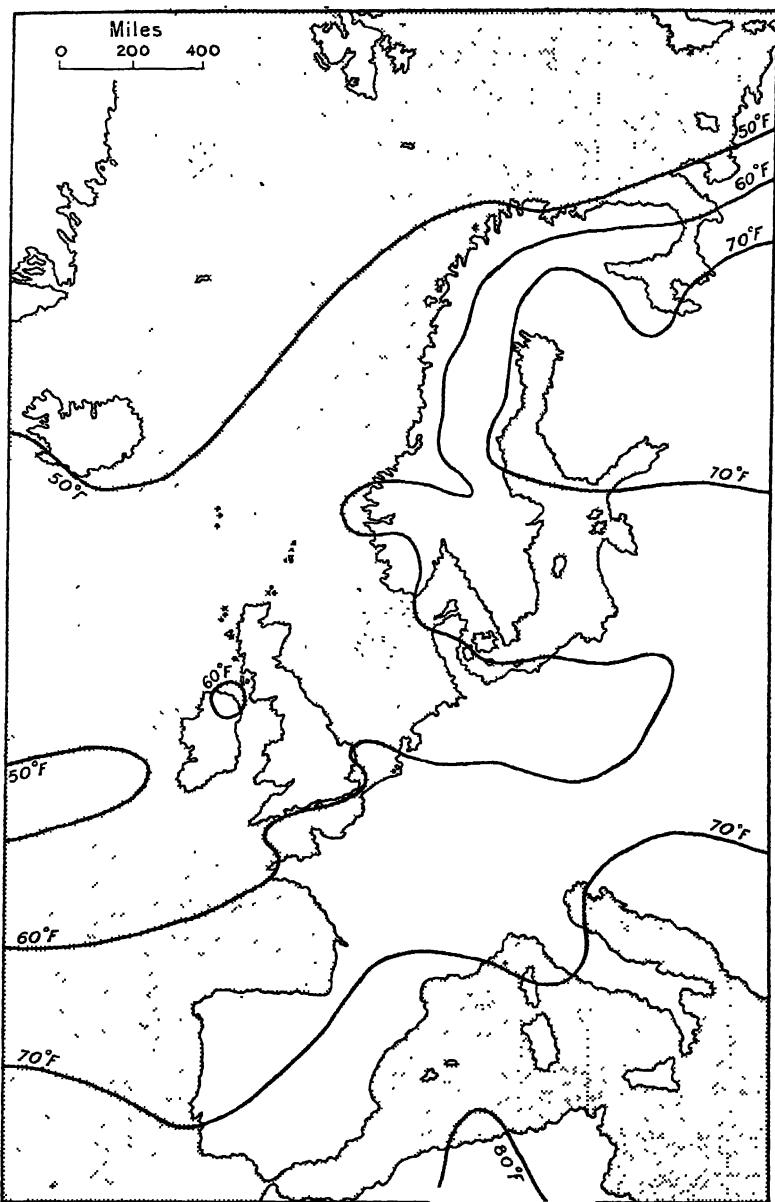


FIG. 22B. Cool Weather Conditions in Summer. Isotherms drawn from the figures published by the Air Ministry for July 22, 1938. In Western Europe the trend of the lines is east-west. With this map should be studied the corresponding pressure map on the page opposite.

Away from the Ocean, the system of summer rains which prevails in Central Europe is gradually reached. Evidence of it is found even in the southeast of England, where a secondary rainfall maximum, due to numerous thunderstorms, is observed in July and August. In Belgium and the Netherlands summer showers are more frequent in the inland provinces, so that rainfall maps show an increase in precipitation from west to east during the month of July. In Brussels the maximum occurs in summer, but in autumn at Furnes. Similarly, in the Netherlands the eastern districts of Groningen, Overijssel, Drente, and North Brabant have their rainfall maximum in August.

But these autumn and winter maxima are not accompanied by a contrast between wet and dry seasons, as in the tropics ; for, in fact, the months are all rainy. The winds from the Atlantic make rain possible at every season. There is no specially favoured season, for each of them gets its fair share. In Dublin rainy days are distributed almost uniformly, winter having 26 per cent., spring 24, summer 24, and autumn 26. The same is approximately true of the amount of rainfall elsewhere, as is shown by the following table :—

Seasonal Distribution of Rainfall

Country.	Place.	Spring. %	Summer. %	Autumn. %	Winter. %
Scotland	Braemar	19	25	31	25
Ireland	Armagh	20	26	29	25
England	London	21	27	29	23
Belgium	Brussels	21	29	28	22
Netherlands	Groningen	17	32	30	21

The regions which are most exposed to the winds from over the Atlantic get the greatest rainfall, whilst those which are removed from that influence, whether by distance or the shelter of an obstacle, are the driest. Differences in rainfall produce real differences in climate and form the true distinction between local climates. On the windward side of the British Isles (that is, the west) there is a wet, maritime region. As it includes the uplands, altitude and position combine to make it the雨iest belt in Western Europe. On the leeward side (that is, the east) there is a drier, more continental region.

The heaviest rainfall occurs in the uplands in the west, where 60 to 80 inches are recorded in the Western Highlands, the Lake District, the Welsh Mountains, and Dartmoor, as well as in the hills

of Donegal, Mayo, Galway, and Kerry. Of these regions the wettest are those which lie in the normal path of low pressure disturbances ; Scotland, for example. The area in Scotland which receives more than 60 inches of rain a year is three times as large as anywhere else in the British Isles. The fact that Ireland gets more than 80 inches of rain even on the east is due to her advanced position out in the Atlantic athwart the path of low pressure disturbances from the Ocean. In this extremely maritime area abrupt heights cause great condensation ; consequently, it contains places which are among the wettest in Europe. Ben Nevis, for instance, has a mean annual rainfall of 150 inches, Glencoe 185, Seathwaite in Cumberland 140, and Llyn Llydaw in North Wales 206.

On the lee side of the uplands, which check the rain-bearing winds from the Atlantic, stretch sheltered areas which are relatively dry. In Ireland, whilst more than 60 inches of rain fall in the Wicklow Hills, Dublin and the estuary of the Liffey get only half that amount, since they are sheltered by the hills. The contrast between the east and west coasts of Scotland is striking. More than 80 inches of rain fall in Skye, but only 24 inches on the shores of the Moray Firth. Hence the clearer, brighter skies which have made the east a good area for wheat ; hence, too, the drier, warmer summers of the valleys of the Spey and Dee, which shelter the charming country resorts of Kingussie, Aviemore, Braemar, and Ballater.

The whole of southeastern England often escapes the influence of the Atlantic. Off the normal track of depressions and subject to conditions which have a continental element in them, it forms a relatively dry region. The rainfall on the coast nowhere exceeds 40 inches, whilst London gets only 24 inches and Oxford 23. A wide belt extending from the Humber to the Thames gets less than 23.5 inches, the minimum of 19.8 inches occurring at Spurn Head in Yorkshire. Whilst the western parts of Ireland and Scotland do not experience great fluctuations in their rainfall system, the English Plain tends to feel the irregularities of the continental system, suffering from occasional periods of extreme drought. In 1921, a year of drought, Scotland got 97 per cent. of its mean annual rainfall, whilst the country south of a line from Plymouth to Yarmouth got only 60 per cent. In London that year was the driest on record for 150 years, and during the whole month of June only a little more than a quarter of the normal rainfall was received.

On the Continent the influence of the Atlantic winds is felt still less in Belgium and the Netherlands. Here the distribution depends on differences of height rather than position. A line drawn from Mons to Maestricht separates two zones. To the northwest in the

CLIMATE AND VEGETATION

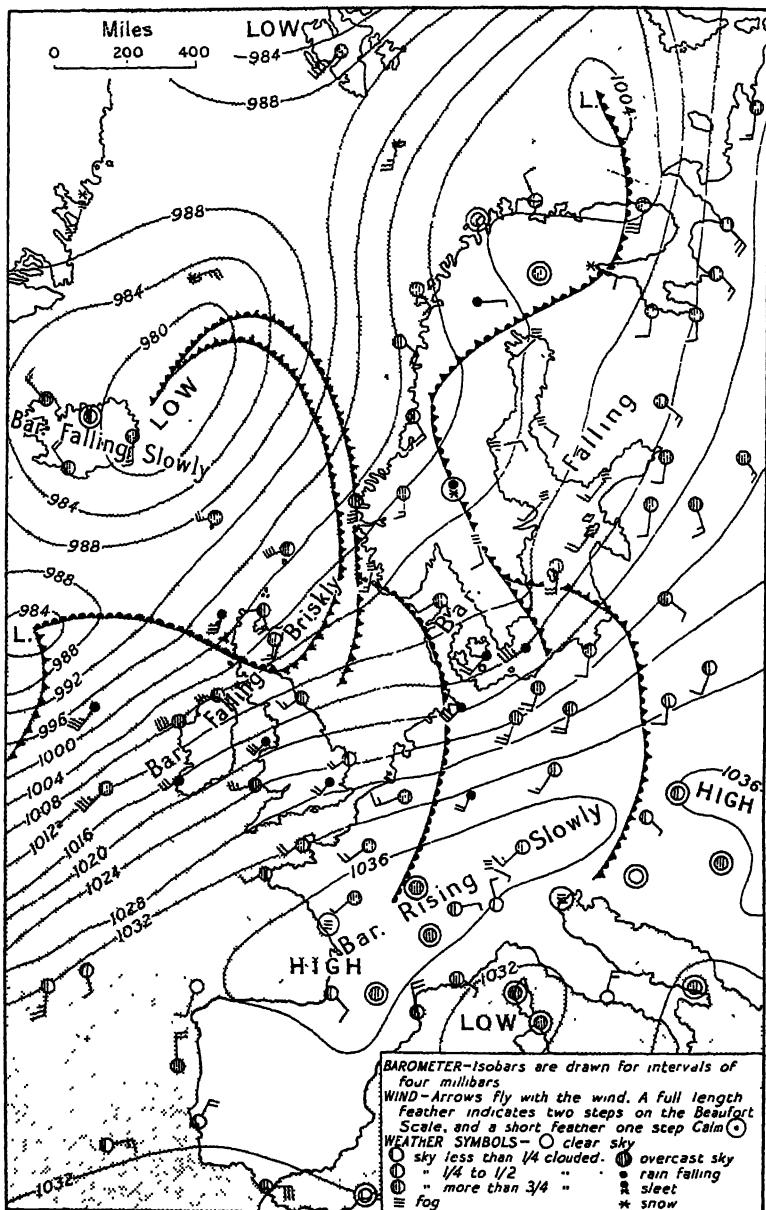


FIG. 23A. Normal Winter Weather in the British Isles. Conditions at 7 a.m. G.M.T. on February 28, 1938. The corresponding temperatures are given in Fig. 22a. The black lines edged with half-discs show warm fronts, those with triangles cold fronts, and those with a mixture of half-discs and triangles occluded fronts. Pressure is low over Iceland and high over southern Europe. Winds are southwesterly, skies are overcast, and rain is falling in places

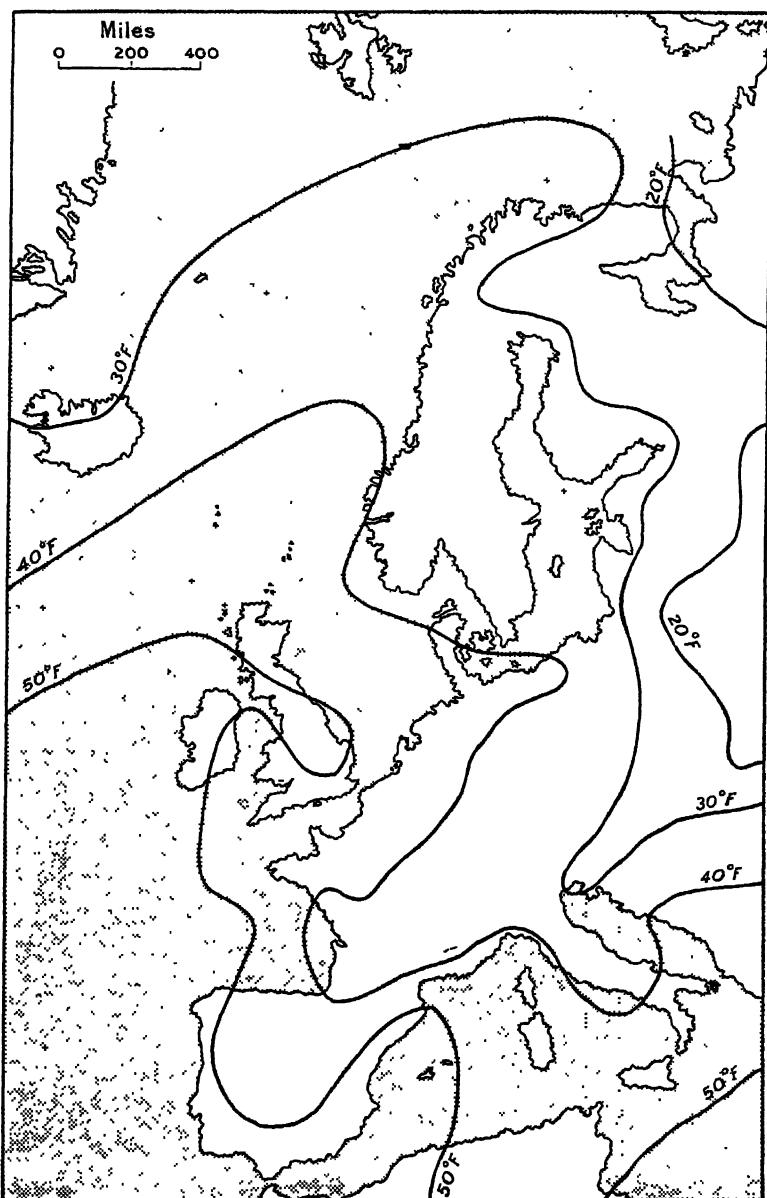


FIG. 23B. Mild Weather in Winter. Isotherms drawn from the figures published by the Air Ministry for February 28, 1938. In Western Europe the trend of the lines is north-south. With this map should be studied the corresponding weather chart on the page opposite.

basin of the Schelde and on the plains of the Netherlands there is a zone of lower rainfall varying between 20 and 30 inches ; whilst to the southeast there is an area in the basin of the Maas where the rainfall is higher and the annual mean ranges between 30 and 50 inches. The difference between the two belts is clearly due to relief, and within each belt the highest areas are distinguished by having the greatest rainfall. In the Netherlands rainfall maxima

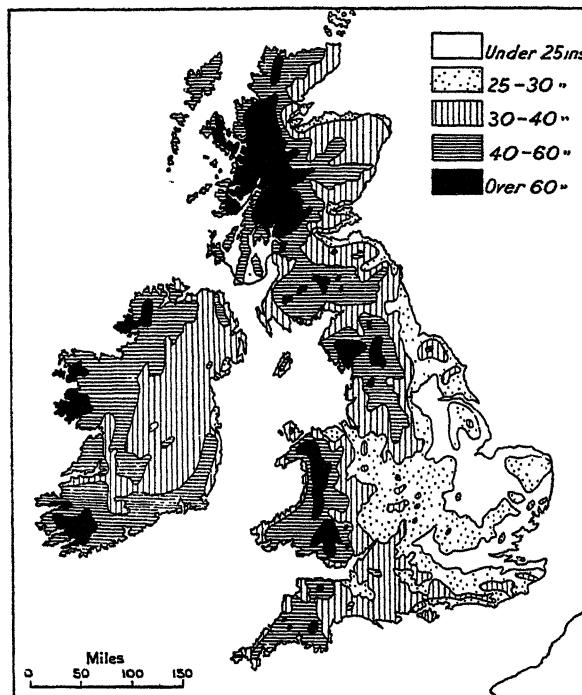


FIG. 24. Annual Distribution of Rainfall.
(After Bartholomew and Mill.)

are recorded on the plateaus of Veluwe and Drente (28 to 29 inches), in western Belgium on the plateau of eastern Flanders (29 to 30 inches). In eastern Belgium the maximum of 51 inches occurs at Hockai, right up in the Ardennes.

4. THE STATE OF THE SKY

Only an imperfect idea of the climate of the countries of Western Europe would be formed from a consideration of the temperature and rainfall alone. The winter is no colder, the mean annual

temperature is no lower, nor is the rainfall greater in certain parts of the south of England than on the shores of the Mediterranean. The three winter months have a scarcely lower mean temperature in the Færöes than on the shores of Lake Garda. Yet there is a striking contrast between the clear skies of the Mediterranean and the grey skies of the North Sea countries, and the real peculiarity of the climate of these damp, cloudy lands is to be found in the state of the sky.

In the western areas scarcely a day passes without the possibility of rain. On the Lakes of Killarney a day on which there are not two or three showers is considered fine ; and in the Hebrides and the Western Highlands rain falls on five days out of every seven. Even in Kent there are three rainy days in every seven. Instead of the brief, hard showers of the Mediterranean, a fine thread-like rain incessantly falls from the low wind-driven clouds. The Dutch call it *motregen*. It sometimes continues without a break for days, imparting a sombre tint to the landscape and to the impression the landscape conveys. It is characterised by a heavy disagreeable drizzle ; by a moist atmosphere which makes damp days and rainy days almost indistinguishable ; by constantly uncertain weather which has given rise to the saying : ‘ If the weather is fine, take your cloak from the shelf ; if the weather is wet, do what pleases yourself ’ ; by sudden changes during the course of the same day, and the swift passage of dense clouds giving way to short bright periods. There is nothing so variable as the skies in the Netherlands. At one moment the sky will be covered with clouds brought by the prevailing wind—fleecy masses which obscure the horizon, or dark, low-hanging *nimbi* that drip with rain. Then a sudden change of wind will rend this great canopy, the sky becomes clear, and the sun sheds a dazzling light on the quiet rain-drenched scene.

Even when it is not actually raining, fog spreads over the whole landscape. This is especially true in winter. Skye is the legendary Isle of Clouds and Mull the Isle of Darkness. To the Gael fog was one of the elements. Sailors in all ages have feared the dismal, misty *Libersee*, or viscous sea around the Orkneys. These conditions are caused by the warm Atlantic air blowing over colder water and having its aqueous vapour condensed into fine drops, while the thick clouds mingle with the sea spray. Ships sail blindly through the curtain of fog which moves along with the North Atlantic Drift. It sometimes happens that during a voyage from Newfoundland to the English Channel the sun is never seen. Even in fine weather a hazy mist spreads over the land, giving soft indistinct outlines to the objects in view. The fog makes outdoor

life disagreeable, and an open-air existence, which is so pleasant in sunny lands, is avoided. The houses have large windows, the better to admit light, the interiors are kept bright and cheerful, and the people love to stay at home in the privacy of their firesides.

The state of the sky may be expressed in fairly accurate figures by counting the number of hours during which the sun shines in the course of a day. The amount of insolation thus reckoned gives a clear idea of the essential character of the climate. In the British Isles the sunniest areas are in the south and southeast. At Hastings the daily number of hours of sunshine amounts to 40 per cent. of what it would be, were there no clouds ; at Torquay 39 per cent. On the other hand, the places with the least sunshine are in the extreme northwest. There Stornoway has 29 per cent., Glasgow 25, and Ben Nevis 17. In the Channel Isles insolation is 60 per cent. greater than in the Orkneys. Jersey, with 55 per cent. in August, is the only place in the British Isles which enjoys as much as half of the possible hours of sunshine, and it has this high degree of insolation during certain months only. In June it has three hours of sunshine a day more than Deerness in the Orkneys ; and this is all the more remarkable since at Deerness, 10° of latitude farther north, the sun remains above the horizon in June two hours a day longer than in Jersey. Such is the effect on the Orkneys of a stormy climate due to their position in the path of low pressure disturbances. On the other hand, fine bright warm calm weather reigns in August in the south of England, and consequently along these sunny shores, which are sometimes called the English Riviera, there is a row of seaside resorts stretching from Kent to Devon.

In speaking of sunshine, it is impossible not to mention the gloomy skies which hang over the industrial centres and great towns. Records of insolation give far lower figures for London, Glasgow, and Newcastle than for the North of Scotland. Precise observation has established the fact that the smoke from factory chimneys affects the atmosphere in such a way as to lessen insolation. A great column of smoke from Lancashire can sometimes be seen crossing the Pennine moors and mingling with the smoke from the West Riding. The smuts which it contains will blacken a fall of snow in two or three hours. London is famous for its fogs. They descend in opaque clouds on the city, and the sharp tang of the thick, yellowish fog catches one's throat. In this damp semi-darkness night reigns at noonday. Lamps must be lit, sometimes for several days on end. Trains are derailed, roads blocked, collisions take place, and every kind of street accident is frequent. At times all traffic is at a standstill. This veritable scourge results from a combination of misty air and the smoke of the thousands of chimneys

in the great city. Hence London has 15 per cent. less sunshine in summer and 50 per cent. less in winter than other towns in the southeast of England. The far greater insolation enjoyed in summer than in winter is due to the absence of domestic fires in the former season. The lack of brightness and cheerfulness which is noticeable in buildings in London is due to the sooty fog which covers the houses and other edifices with sticky grime.

5. VEGETATION

Northwestern Europe lies within the forest belt which stretches across Eurasia from the Atlantic to the Pacific. But it has its own characteristics which distinguish it from the regions with cold winters, a continental climate, and mainly coniferous forests. Owing to the mild winters of its maritime climate, its forests are composed of broad-leaved trees like the oak. But the vast mantle of woodland which formerly covered enormous expanses has never been continuous, at least not since the climate assumed its present characteristics ; and it shares the area with another vegetation-type, the moorland and heath type, in whose frequent occurrence lies the peculiarity of much of Western European scenery.

Moorland, which occurs wherever the acidity of a peaty soil and the force of the wind from over the Atlantic makes the growth of trees difficult, occupies the uplands of the British Isles, where the tree-line is astonishingly low. On the Continent, too, the moorland type is constantly at grips with the woodland on uplands like those of the Ardennes and Vosges, whose very names suggest the idea of forest. But in Europe vegetation-types are no longer due to nature alone, for few parts of the world have undergone such great transformations at the hand of man. Through both woodland and moor he has opened clearings, destroyed the natural vegetation, planted his field crops, his meadows, and his orchards, and has constructed a wholly new landscape ; so that to-day the aspect of the vegetation is the result of a combination of woods, moorland, and cultivated areas.

Only remnants survive of the ancient mantle of forest which once covered the plains and valley bottoms. For centuries the trees have gradually been thinning out, and of all the countries in Europe, those around the North Sea are among the poorest in woodland. Only 3·2 per cent. of the surface of the British Isles, 5·8 per cent. of the Netherlands, and 4 per cent. of Denmark is forested. If the percentage is as high as 12 in Belgium, it is because this country includes a portion of the Ardennes, an area which forms part of the woodland region of continental Europe. In England the largest woods occur in the southeastern corner on the patches of sandy soil on the Weald and in the Hampshire basin. Other

areas of woodland occur in the hilly Old Red Sandstone districts on the eastern border of Wales in Monmouthshire, Herefordshire, and Gloucestershire. In Scotland excellent timber grows on the southern slopes of the eastern Highlands, where the trees are sheltered from the westerly winds. The poverty of woodland in Ireland, where the percentage is only 1·5, is one of the oldest and most peculiar features of the geography of the country. ‘Even in the Middle Ages,’ says

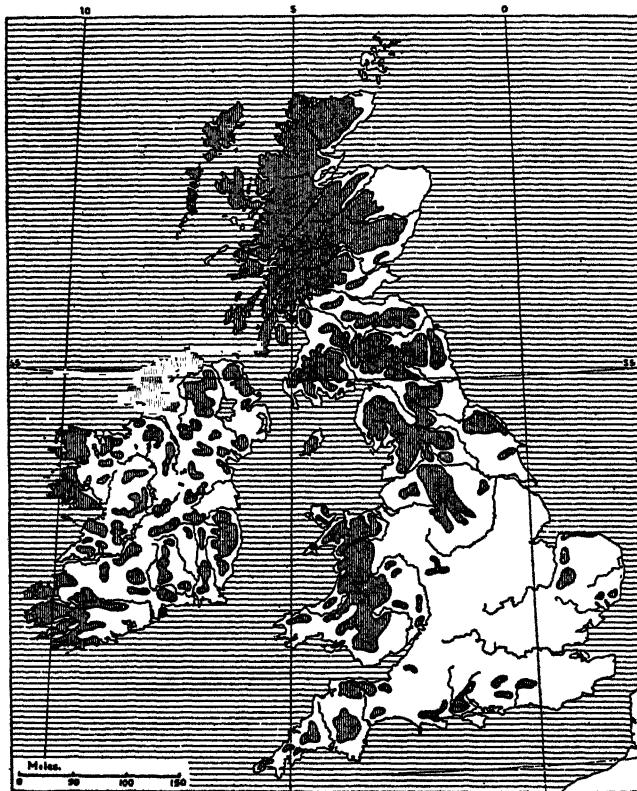


FIG. 25. Distribution of Moorland and Heath.

Élisée Reclus, ‘the absence of timber led to the use of whalebone for the construction of barrel-hoops in various parts of the island. Thirty years ago, in County Mayo, the peasants thought that trees were merely tall grass !’

In Western Europe, moorland is a familiar sight from the German Plain and the Netherlands to the Irish and Breton promontories which overlook the Atlantic. Moorland and heath form a primitive

vegetation-type, whose characteristic element is heather. This plant, which is proper to mild climates with great atmospheric humidity, does not grow on steppes, but flourishes in maritime countries. Moreover, being xerophilous, it is suitable to peaty soils which kill trees, as well as to sandy soils which do not hold moisture. It covers large, drab areas of bare, dismal ground on alluvial plains as well as on upland regions. The general name of moorland may be applied to the type ; but there are two varieties, the peat moor and the sandy moor or heath.

Popular terms of long standing, such as *moor*, *fen*, *venn*, *veen*, *fagne*, and *fange*, are used in all the North Sea countries to denote the peat moor. The extensiveness of the beds of peat in Western Europe suggests that the present state of the ground is due to conditions which existed in no very distant past. Nearly all the beds were formed during the humid periods which were interposed between the drier phases of the Ice Ages. Over wide stretches of plain and upland peat strikes the predominant note in the landscape.

On upland moors the peat beds are thickest on the high plateaus where the rainfall is heaviest. On the Continent they fill extensive hollows in the Ardennes, where they are known as *fagnes*. In the British Isles their black, spongy masses, cut by gullies and pierced by rocky crags, cover the flattened tops of the upland regions in Scotland, Ireland, Wales, and the Pennines (see Fig. 25). When well drained, the peat is covered with a mantle of heather which stretches as far as the eye can see. With the heather is associated the bilberry. In damp hollows, saturated masses of peat allow nothing to grow but aquatic plants like sedges, rushes, and galingales, as well as cotton-grass, whose white blooms strew the edges of pools of blackish water.

Lowland peat moors occur near sea level in the bottoms of wide valleys and damp plains. They occupy part of the Central Plain of Ireland, where they are known as *bogs* ; the shores of Morecambe Bay, where they are called *mosses* ; the Fen District around the Wash ; the former estuarial district of the Norfolk Broads ; and the lowest strips of the deltaic portion of the Netherlands.

Sandy moors are also heather-grown, but are to be distinguished from peat moors in that they favour tree growth. In them the two vegetation-types of forest and moorland usually mingle ; in fact, sandy moors are often mere degenerate woodland. Conversely, many of the existing woods are due to the afforestation of moorland. Wherever dry, porous, infertile soils outcrop in the British Isles, the moorland vegetation-type is found ; as, for instance, on the Pliocene crag in East Anglia, on the Eocene sands of the London basin ; on the sand which lies between the chalk strata in the

Weald ; on the variegated sandstone in the Midlands ; on the crystalline rocks of Exmoor and Dartmoor ; and in the eastern Highlands of Scotland. It is also found on sandy areas in Flanders and the Belgian Campine, and on the sandy, gravelly watersheds which separate the larger valleys in the Netherlands.

On the uplands as well as on the plains, moors and heaths offer simple austere landscapes, but there is something imposing in their wide spaces, and the detail of their scenery affords many charming shades of colour. In the eastern Highlands many of the hill-slopes are moorland, even below the 1000-foot contour. In winter the hard, grey tints of the heather-tufts give the general tone of the landscape. But in spring other colours are substituted, such as the bright green of the grass, the warm dark-violet of the whortleberry, and the pink and red of the heather-blooms. Sometimes amidst the barren moorland vegetation stretches of turf spread out like grassy carpets studded with flowering plants such as the shamrock, campanula, lotus, milkwort, and cinquefoil ; whilst here and there rise juniper and gorse bushes, bracken brakes, and clumps of pines and birches.

The natural vegetation-types, both moorland and forest, have retreated before the advance of human cultivation. But although the woodland has almost disappeared, moors and heaths have survived over wide areas, resisting the attacks of the plough. The great proportion of waste land in such densely peopled countries is astonishing. This is because the thin, dry soil of the moors and heaths scarcely suits the plants that feed man and his domestic animals. Besides, the cool damp summers sometimes deprive the ripening grain of the sun's warmth, and the heavy rains in autumn and spring check the preparation of the land for sowing.

These drawbacks in the climate are particularly serious on the uplands in the west of the British Isles, where the wind blows with great force on the exposed hills, and fogs and clouds allow only a diffused light and feeble warmth to filter through them. Hence, the harvests are always late and sometimes uncertain, and the limit of agriculture falls to the 800- or even the 600-foot contour, an elevation at which the line of separation between upland and lowland may be fixed. These factors all combine to lessen the acreage of arable land in the British Isles by making the cultivation of moorland and heath impossible, especially in the west. Scotland, Wales, and Ireland have a relatively greater area of uncultivated land than any other country in Western Europe, except Norway. The waste includes three-fourths of Scotland and Ireland, half of Wales, and a quarter of England. Certain districts are almost wholly uncultivated ; for instance, 96 per cent. of Sutherland and 85 per cent. of Connaught lie waste. 'To hell or Connaught' is a common saying.

PLATE XIII



[Photo: A. Demangeon.]

A. TYPICAL PARKLAND IN THE CENTRAL PLAIN OF IRELAND
Graiguenoe Park, near Thurles, Tipperary.

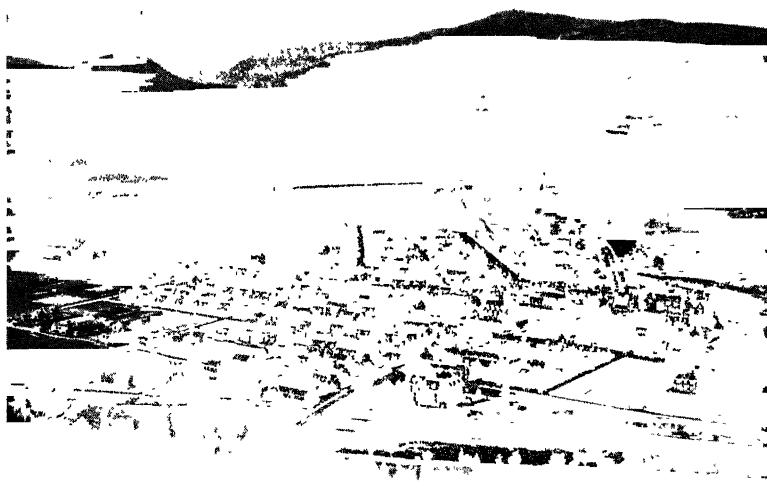


[Crown Copyright.]

B. PEAT BOG IN STRATH DEARN, SCOTLAND
The stumps of an ancient pine forest have been revealed by the removal
of the peat in the foreground.

[To face page 86.]

PLATE XIV



[Photo: Valentine.

A. BALLATER
A summer resort in Aberdeenshire.



[Photo: Preston, Penzance.

B. THE GARDENS AT Tresco Abbey in the Scilly Isles
The agaves and yuccas growing in the open give the scene a subtropical appearance.

These climatic influences, together with that of relief, have caused the remarkable contrast in agricultural development that exists between the east and west of the British Isles. The west with its uplands and moors turns naturally towards pasturage rather than agriculture, on account of the humidity of its atmosphere and its low temperatures in summer. The east with its plains and friable soil prefers agriculture to pasturage, owing to its somewhat continental climate, its greater dryness, and its higher temperature. The contrast seems to have been noticed in times past by Julius Cæsar, who states that there was a well-developed agricultural system in the districts near the east coast, but a prevalence of pasturage in the interior.

The distribution of cultivated plants depends in large measure on these general conditions. Wheat is concentrated particularly in the east, where it is removed from the direct influence of the maritime climate and enjoys more sunshine. Thus, it is grown around Dublin, Edinburgh, and in the district between the Wash and London. The eight eastern counties of England, which form 11 per cent. of the area of the island, contain 42 per cent. of the acreage devoted to wheat in the whole of Britain; and in them wheat occupies between one-sixth and one-quarter of the arable land. Barley, which can stand damp better than wheat, has a wider distribution, occupying a larger area in Wales and Scotland. Certain varieties which ripen early grow even in the Orkneys and Shetlands. Oats, which can ripen in rather damp, cool summers, is the chief cereal crop in the north and west. It covers twice the acreage of wheat and barley in Wales and southeastern Scotland, and it is the only corn crop in the north and northwest of the latter country, where it is by far the chief cereal, and where oatmeal porridge is the traditional breakfast dish in hut and palace alike.

Many other plants, like the beetroot, lucerne, hops, and vine, are restricted or excluded by the climate. The absence of the vine is a feature of the countryside which causes a contrast between the British Isles and the district round the Schelde on the one hand and the more southerly districts along the Seine, Loire, Mosel, and Rhine on the other. Wine is produced in neither England nor Belgium. The vine, which flourishes on sun-drenched slopes, is repelled by the cool air and overcast skies of the autumn. There are no sunny hillsides clad in vines and enlivened by the songs of the grape-gatherers. This is indeed the land of beer, that characteristic drink of the Germanic peoples.

Wherever there is no moorland or heath, the green of the grass tends to become the dominant note. The constant dampness of the air, the moderate warmth of summer, and the rare occurrence

of drought favour the growth of grass and leguminous plants, and especially the development of their green parts. The circumstances which favour grass increase towards the seat of maritime influence. This has been turned by man to his own purposes, for nowhere else in the world can he so easily replace cereal cultivation by pasture when he wishes to give up agriculture. The permanent pastures which he has established tend to become in the British Isles and even in certain other countries bordering on the North Sea the predominant feature of the cultivated landscape.

So the characteristics of the maritime climate are reflected in the nature of the vegetation-type, whether these are natural or man-made ; and they manifest themselves in the very presence of plants whose affinities are those of the South. The mildness of the winters gives the western shores of the English Channel a mean January temperature as high as that of the coast of Provence. Hence, the vegetation sometimes assumes a tropical semblance (see Plate XIVB). In the Channel Isles magnolias flourish in the open, and the myrtle, fuchsia, and camellia develop into trees. The aloe thrives on the coasts of Cornwall and in the Scilly Isles, and the fig will grow near Dorchester. In Tipperary the laurel attains a height of 20 or 30 feet, and even in Bute it develops into a fine flowering tree. Around Killarney and Glengariff, in southwestern Ireland, the plant life is reminiscent of the luxuriance of the tropics. Under the same mild influences of the winter green shrubs which die in similar latitudes in Central Europe advance in the countries with a maritime climate right into the far north. Some varieties of heather, like *Erica ciliaris*, grow as far north as Ireland, *Erica tetralix* as far north as Scotland, and *Erica cinerea* in Norway. The gorse (*Ulex europeus*) is found in Scotland in Lat. 58° N., whilst frost kills it in Sweden. Although the holly cannot survive the severity of the winter on the uplands of the Ardennes and on the plain around Cologne, it penetrates as a beautiful tree with glossy leaves along the Atlantic seaboard as far as Lat. 62° N. in Scotland and Norway.

Agriculture has itself profited by the mildness of the maritime climate, which is favourable to delicate plants. In the islands and peninsulas which are bathed in warm air and thus sheltered from frosts, early vegetables are planted at the first breath of spring, and their harvests follow each other in order as they mature. The first new potatoes grown in British soil come from Jersey ; later those from Cornwall reach the markets in the big towns. They are followed by others from Kerry and Waterford, and lastly by those from Ayrshire.

CHAPTER IV

RACIAL ELEMENTS AND POLITICAL DIVISIONS

1. RACIAL ELEMENTS

THE first immigrants and the first influences of civilisation reached the British Isles from the south of Europe. From the dawn of history right up to the Middle Ages the islands remained remote and isolated on the fringes of the world, and they were visited only by the colonists, soldiers, and traders of the then more civilised Mediterranean countries. But towards the end of classical times settlers from the North began to arrive. Germanic tribes spread over the North Sea shores, establishing themselves mainly on the east of Britain, but also in the lower valleys of the Rhine, Maas, and Schelde. They turned the North Sea into a veritable 'German Ocean', and they made the British Isles into the home of a peculiar civilisation and the cradle of a nation with characteristics of its own.

THE SOUTHERN RACES. Unlike the coastlands of the Mediterranean, the countries of the North Sea long remained uninhabitable. The edge of the ancient ice-cap had advanced as far south as the Rhine and Thames, and human settlement could not begin until after its retreat. Even then the areas which were left cold and damp immediately after the retreat of the ice had to be shunned for some time. The most perfect traces of the first settlements of palaeolithic man are found in the caves and sheltered corners of the valleys of the Maas and Lesse in Belgium. But these pioneers of civilisation also reached England, for traces of them may be followed as far north as the counties of Derby, Lincoln, and Denbigh. They abound on the East Anglian plain, in the Thames basin, and especially in the warm, sunny regions bordering on the Bristol and English Channels.

The first men to occupy the British Isles after the paleolithic peoples belonged to a race which then dwelt in Gaul and Spain. In physical features—particularly in their short stature, brown hair, and long, narrow dolichocephalic head—they resembled many of the present-day inhabitants of the Mediterranean lands. Hence, they have been thought to have been of Mediterranean, or Iberian, origin. Some anthropologists even consider that they form the basis of the whole population of the British Isles to-day. Finding an

almost empty space before them, they swarmed into the islands and spread to their remotest ends. Their hearths, polished stone implements, megalithic monuments, and long barrows are found in the most distant islands and wildest promontories (see Fig. 26). Even on Achill Island and in the Aran group off the west coast of Ireland, in the Hebrides, in the Orkneys and Shetlands, and in Jersey traces of them are not wanting.

Another race, which originated in Central Europe and for that

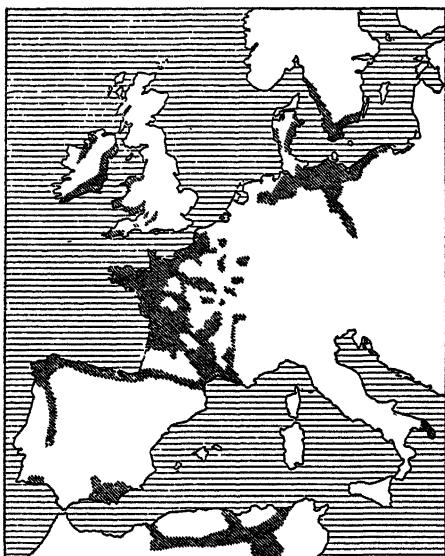


FIG. 26. Distribution of Dolmens in Western Europe. (After Fleure and James.) The map shows that the dolmen civilisation was derived from the Mediterranean about the end of the Neolithic period and passed along the coasts to Ireland. It seems to have crossed from France to southwestern Britain by way of Cotentin and Armorica.

reason is sometimes known as the Alpine, advanced subsequently to the shores of the North Sea. These were men of lofty stature, brown hair, and big, round, brachycephalic heads. Traces of their civilisation are recognised right across Europe from Moravia and Bohemia to the east of England and south of Scotland, where their bronze articles and round barrows have survived. Archæologists are tempted to exaggerate their share in the peopling of the British Isles; but, on the other hand, anthropologists point out that they have left little mark on the prevailing dolichocephalic type of the

early neolithic inhabitants. The Alpine race seems to have had far greater influence on the forms of civilisation than on physical characteristics.

The same stock supplied a third stream of migrants whose outposts reached Britain about the 6th or 5th century B.C. These people, who came from Central Europe and who all spoke the same language, are often referred to as Celts, though this term applies properly to their civilisation and language only. Their settlement spread over several centuries, the last comers reaching Britain only a short time before the arrival of Julius Cæsar and his legions on the shores of the Straits of Dover.

In contrast with the Mediterranean race, the Alpine peoples—and especially those whose civilisation was Celtic—have contributed but little physically to the population of the British Isles, for right up to the invasion of the Germanic tribes the ethnological basis of that population was formed of Mediterranean material. The contribution of this race lay rather in its civilising influence. It widened the commercial horizon of the areas it occupied ; and its language became the medium for the exchange of goods and ideas. The British Isles appeared in the geography of the ancient world under a Celtic name. The term *Pretanic* was borrowed by the Greek traveller Pytheas to denote the two large islands. Through the agency of the Celtic-speaking race Britain learnt the art of making bronze, then that of working iron ; and it was through their traders that the tin of Cornwall and Devon and the gold of the Wicklow Hills reached the markets of the Mediterranean. The desire to gain possession of these sources of commercial wealth led the Romans to the shores of the English Channel and the North Sea.

In 55 and 54 B.C., Julius Cæsar landed on the southeast coast of Kent, but on each occasion left the island in the same year. In A.D. 43 the Romans came again, but they abandoned the country in the year 410 under the pressure of the Germans, who were threatening the Empire on the Continent. The Roman occupation of Britain did not lead to colonisation, but was in fact limited to commercial exploitation and was based on a great system of fortresses and roads. The value of the island to the Romans lay partly in the eastern plains, where the countryfolk produced corn, meat, and wool ; and partly in the uplands of the west, which were rich in minerals. Again and again the cultivated lowlands furnished provisions for the Roman legions in Gaul and on the Rhine. Roman traders obtained tin in Cornwall, lead in the Mendips, iron in the Forest of Dean, lead and copper in Wales and the Pennines, and, no doubt, also gold and copper from Ireland.

Their plans of occupation and defence were devised to safeguard the exploitation of the country. In the north the lowlands were

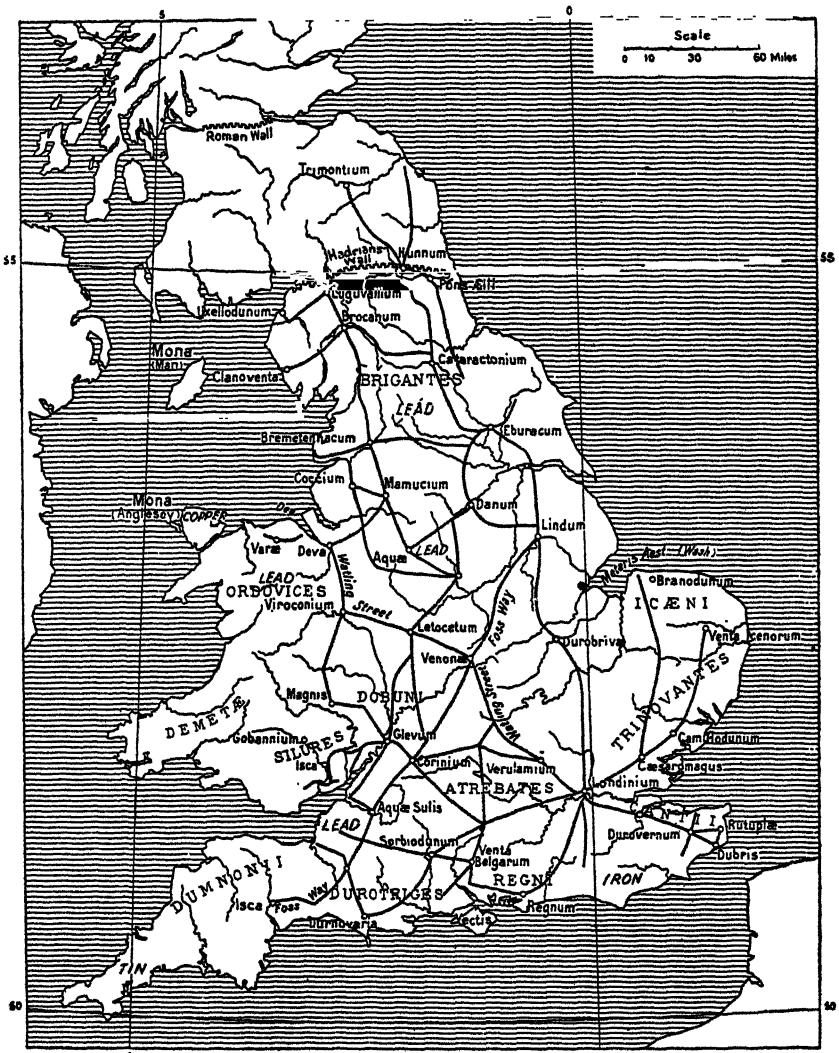


FIG. 27. Roman Road System in Britain.
(After the Ordnance Survey.)

protected against the highlanders of Scotland by two fortified lines. The first, known as Hadrian's Wall, was built in A.D. 120 and

stretched from the Solway Firth to the mouth of the Tyne ; the second, known as the Antonine Wall, was constructed in A.D. 143 between the Clyde and the Forth. Behind these lines of defence lay the great citadel of Eboracum (York). In the west, with its metalliferous uplands, Deva (Chester) guarded the route to Ireland and was supported by a chain of forts reaching as far as Caernarvon. Viroconium (Wroxeter) held the approaches of the Severn valley against the wild Ordovices of the Welsh uplands. Glevum (Gloucester) and Isca Silurum (Caerleon) kept watch on the southern borders of the same mountains.

To connect up these defences and to maintain communications with the Roman bases on the Straits of Dover, a network of roads was constructed (see Fig. 27). From the seaports of Rutupiæ (Richborough) and Dubris (Dover) a Roman highway followed the strip of dry ground which separated the marshes of the Thames valley from the forest of the Weald. It crossed rivers at Durovernum (Canterbury) and Durobrivæ (Rochester) and passed over the Thames on the original site of London, causing the growth of this town. From London three highways led almost in a straight line to the frontiers of the occupied territory : (1) Ermine Street went by way of Camulodunum (Colchester), Lindum (Lincoln), Danum (Doncaster) to Eboracum ; (2) Watling Street passed through Verulamium (St. Albans) and Viroconium to Deva ; (3) a third led through Pontes (Staines) to the west, sending out branches to Glevum, Isca Damnoniorum (Exeter), and Durnovaria (Dorchester). Foss Way, an important cross-country route, followed as far as possible the ridge of limestone hills in the Midlands to connect Lincoln with Aquæ Sulis (Bath) by way of Corinium (Cirencester).

This system of exploitation, based on control of the routes and strategic points, explains why the only surviving trace of the Roman occupation of Britain consists of a series of commercial and military centres spread out along the lines of communication. Like the Danes of later times, the Romans developed town settlement. Their commercial activity did not leave the highways. Many modern towns, like York, Lincoln, Cambridge, Colchester, Gloucester, and Canterbury, have grown up round Roman nuclei. In some of them too were established the earliest centres of Christianity and the first bishoprics. But from the 5th century onwards a change of direction occurred in the general affairs of Great Britain, for Germanic settlers came in swarms from the North, swooped down on the coasts, occupied the country, and established themselves in it for good.

THE NORTHERN PEOPLES. For six centuries Germanic immigration continued to bring an infusion of new blood to the population

of the British Isles. The newcomers were from two sources : the first consisted of Frisians, Saxons, Angles, and Jutes who dwelt along the coast from the mouth of the Rhine to Jutland ; the

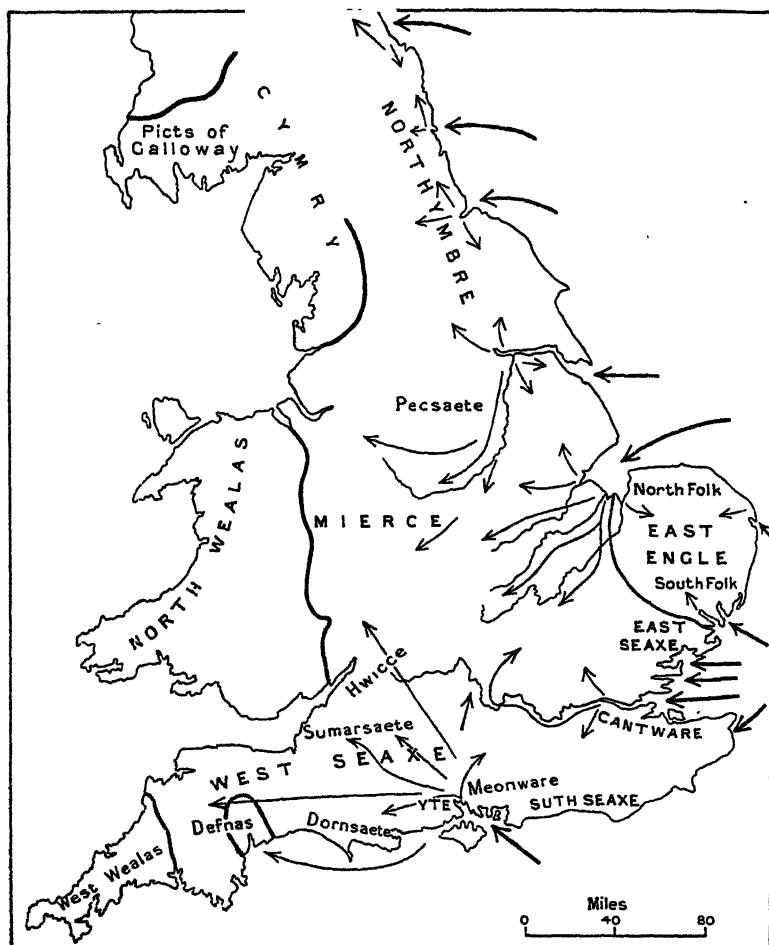


FIG. 28. Settlement of the English in Britain. The thick arrows show the main approaches, the thinner arrows the lines of penetration along the rivers.

second comprised Scandinavians, Danes and Norsemen, who inhabited the shores of the Danish straits and Norwegian fjords. These peoples were all sea-faring. They sailed along the coasts, crossed the sea, and penetrated up the estuaries. Mackinder has

shrewdly pointed out that the same method was adopted by the Arabs in penetrating into Africa through Zanzibar and by the Europeans who entered India through Calcutta and Bombay, and America through Manhattan Island and the Hudson River. The first Germanic settlement was a Jutish colony founded on the Isle of Thanet on the southern bank of the Thames estuary. The old Roman town of Durovernum on the Stour became Cantwara-byrig (= the town of the men of Kent), *i.e.*, Canterbury. This vigorous community, though it controlled the Channel crossings, was unable to expand into the interior, but was shut in by the Wealden forest, the marshes of Romney, and the Thames estuary.

A party of Saxons, penetrating up the tidal waters near Chichester, landed at the foot of the South Downs and set up another kingdom, that of the South Saxons, or Sussex. This kingdom long remained cut off from the interior by the Wealden forest, and the men of Sussex, isolated by their woodland barrier, were the last to be converted to Christianity. The magnificent estuary of Southampton Water, sheltered by the Isle of Wight, was entered by another party of Saxon and Jutish colonists who became the germ of the great kingdom of Wessex. From this base proceeded expeditions which took the Saxons through Hampshire, Wiltshire, Dorset, and Somerset to the borders of Devon and the banks of the Severn. For a long time Exeter marked the western limit of this kingdom ; but in A.D. 815 Cornwall was conquered. However, it was not immediately assimilated, for it kept its Celtic dialect until the beginning of the 19th century.

Other Saxons sailed up the estuaries of the Colne and Blackwater and founded Essex, or the kingdom of the East Saxons, around Colchester and Maldon. Pushing on farther westwards, they captured London and formed new settlements in Middlesex (= middle Saxons) and Surrey (= south kingdom). Bands of Angles established on the banks of the Orwell and Yare the kingdom of East Anglia, which was divided into two parts : that of the North folk and that of the South folk. Other Angles ascended the Humber, Welland, Nen, and Ouse, drove back the Britons to the Severn, and organised the kingdom of the March-lands, or Mercia, which comprised the whole of the Midlands as far as Shrewsbury and Gloucester. Further expeditions of the same tribe gained a footing between the Humber and Forth on the Ouse, Tees, Wear, Tyne, Tweed, and Esk, the political union of whose settlements constituted the kingdom of Northumbria. On the northern borders of this state Edwin, King of Northumbria, founded the fortress of Edinburgh about the year 630 to check the dispossessed Picts. By

the beginning of the 7th century Northumbria had extended its authority westwards as far as Chester.

The Anglo-Saxon settlements along the coasts, which were often hostile to each other, did not all share the same destiny. Some, like Kent, Essex, Sussex, and East Anglia, were restricted to the coast, since they were shut in by marshes and forests. But those which had their beginnings on Southampton Water and the Humber gradually extended their borders to the Midlands, where they met and came into collision with each other. They ensured the future of Germanic settlement by establishing themselves in the heart of the country and by driving back the Celtic-speaking people into the western uplands. Little is known of the details of the slow process which in the course of three centuries transformed Britain into an Anglo-Saxon country. But the main effects are clear. Celtic Britain became Germanic England, the region was covered with Teutonic villages, the population became sedentary and adopted an agricultural mode of life. The sea which had brought the new settlers seemed forgotten ; though the love of sea-faring was not long in springing up once more.

THE SCANDINAVIAN SETTLEMENT. The awakening of the sea-faring spirit was due to Scandinavians. From the 8th century onwards, swarms of bold sailors from the sounds and fjords of Scandinavia descended on the countries of the South. These Northmen, or Norsemen, found the British Isles in their path and landed there. In the 9th century a powerful force of Danes disembarked on the banks of the Humber and succeeded in extending their authority from the Tees to the frontiers of the Saxon kingdom of Wessex along the Thames. The whole of this territory was so thoroughly subdued that it was given the name of Danelaw, and Danish influence was strong enough to leave its mark on the place-names. The ending *-by*, which is very frequent in the east of England (*e.g.*, Whitby, Selby, Grimsby), indicates a name of Danish origin. After a long struggle with the Saxons a Danish dynasty gained possession of the throne of England. When King Knut reigned over England, Denmark, and Scandinavia, the North Sea acted for the first time as a bond of political unity.

With the arrival of the Northmen from their fjords at the end of the 8th century, close relations were established between Norway and Scotland. Norse settlements were founded on the coasts and islands of Britain. The Shetlands and Orkneys were occupied and became bases for future operations. The wickings then advanced along the coasts of Britain, which were very like their own homeland, entered Sutherland, Ross, Inverness, Argyll, Galloway, the Isle of Man, and even Wales. But, except in the smaller islands, they did

not advance inland. The sea carried them right into the firths and lochs, but the inhospitable mountains checked them. The whole of the north of Scotland was engulfed in a Norse hegemony which lasted until the 13th century. The Hebrides, which were known to the Scots as the Western Isles, were called the Suthreyjar, or Southern Isles, by the Northmen. This name is still preserved in the title of the bishops of Sodor and Man. Sutherland (= southern land) remained a Norwegian possession until the end of the 12th century. Its name shows that it formed the southernmost province of the Norse kingdom. The ecclesiastical affairs of the Hebrides and Isle of Man were long administered from Trondheim. The place-names in the Orkneys and Shetlands are all of Norse origin, and even at the end of the 18th century the old Norse tongue was still spoken in a few families. On the mainland, too, many place-names in Sutherland are Scandinavian, and the number of them is enormous in Lewis, Skye, Uist, and Islay. In Ireland the same kind of coastal settlement brought Norse adventurers to Limerick, Waterford, and Dublin. Settlement began here at the end of the 8th century and did not end until the beginning of the 12th.

The settlement of these sea-faring peoples in the British Isles was a decisive event in the history of civilisation in Britain and opened the way to a maritime career. The Northmen, who were bold sailors and traders, had extended their travels far towards the north, east, and west. They had reached the eastern Baltic in the year 850, rounded the North Cape about the same time, had occupied the Færöes in 861 and Iceland in 870, had landed in Greenland in 985, and had certainly discovered the coasts of Labrador by the beginning of the 11th century. Though Europe was still for centuries to be tied to coastwise navigation, these pioneers showed how to sail across the open sea. Overseas commerce was in their hands. They despatched amber to the East by way of the Baltic, the Russian rivers, and the Black Sea ; and they received valuable commodities by the same route. Wisby, on the island of Gotland, was the *entrepôt* on which their commerce centred. Through these England was led to trade with distant countries, widened her outlook, and established relations with the Baltic. Thousands of Anglo-Saxon coins have been found in Sweden and Gotland. Bergen and Rouen welcomed English traders, and for the first time since the Roman occupation London was recorded about the year 970 to have become a centre of trade with the Continent. Commerce fostered town life. In Ireland the first towns were all ports and grew up round the Scandinavian settlements at Dublin, Limerick, Waterford, Wexford, and Cork. In England the same influence passed inland

and caused flourishing towns to spring up at Stamford, Derby, Leicester, Nottingham, and Lincoln.

The political unification of the country was the work of the various Germanic peoples who conquered the island and introduced their own civilisation from the Continent. In contrast with Gaul, where the Germanic peoples allowed the natives to live as they had done under the Romans, themselves finally adopting from the conquered Gauls their language, religion, political system, and even their legal ideas, the Germanic peoples in Britain replaced the native civilisation with a new form. They set up new kingdoms whose fusion gave rise to Anglo-Saxon unity. Their unity had its focus in the Thames basin around Southampton and London, where the centre of gravity of Anglo-Saxon solidarity was removed from Celtic and Scandinavian menace.

But a country which was physically subdivided and consisted largely of islands and peninsulas naturally encouraged local independence. Hence, centuries of English domination have not completely extinguished the desire for self-government or national independence. Wales was not finally incorporated in the kingdom of England until the 16th century, nor were Scotland and England united until the beginning of the 18th. Ireland has regained its political independence in the 20th century. The regional communities of the British Isles have always been animated by the spirit of local freedom and have always rejected continental methods of centralisation. Owing to this, a tendency to a system of federalism has grown up in recent years. The genius of the peoples of Britain understands such systems of association in which the partners keep their due share of liberty. Just as it has inspired relations of this kind overseas, so it has allowed them to exist in the motherland itself.

2. THE GROWTH OF THE ENGLISH NATION

By the end of the 5th century three Germanic tribes had established themselves in Britain. The Jutes had settled in Kent, the Saxons on the south coast and along the Thames estuary, and the Angles on a long stretch of the east coast. In spite of their dispersion, these settlements became conscious of their common civilisation through the constant hostility of the dispossessed natives. The name of the Angles, who occupied the largest portion of the country, was soon adopted as the common designation of all the invading tribes, who called themselves English and their country England. Of all the kingdoms, both large and small, into which the conquest had divided the country, three showed themselves capable

of bringing about the political union of them all. These were Wessex in the south, Mercia in the centre, and Northumbria in the north. It was Wessex that prevailed. By the end of the 9th century this kingdom had made itself supreme in the island, had annexed West Wales (Cornwall), and had reduced North Wales and the other English kingdoms to submission. The king of Wessex began to assume the title of King of England. As frequently happens,

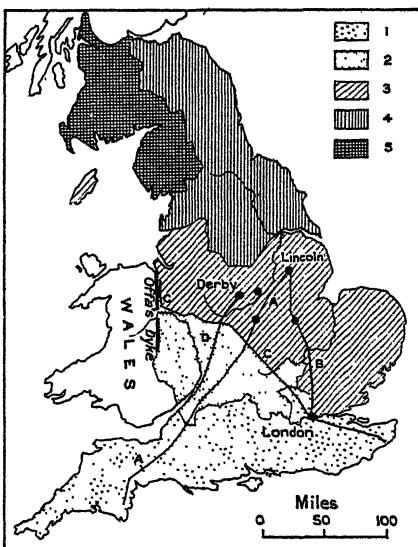


FIG. 29. The Stages in the Political Unification of England by the Kings of Wessex. (After Droysen and Poole.)

1. Kingdom of Wessex, 802-839.
2. Additions between 871 and 901.
3. Conquests between 901 and 925.
4. Further conquests, 925-940.
5. Additions between 940 and 955.

A, Foss Way; B, Ermine Street; C, Watling Street; D, Ryecenield Way. The five boroughs are shown by black circles.

the English nation as a whole found its unity and became fused into a single political unit by being confronted with foreign invasion. This external force was supplied by the Danes.

The Danish invasions began towards the end of the 8th century and ended in wholesale settlement about the end of the 9th. The Danes made a clean sweep of all the English kingdoms, excepting Wessex, which was too far away to be conquered and with which they were forced to share the island. The king of Wessex therefore became the only king of the English, the national sovereign, the

champion of Christianity against the heathen Danes from over the sea. So, towards the middle of the 10th century, when the kings of Wessex had driven back the now weakened Danes, they extended their supremacy to the Humber and even to Northumbria; and imposed their suzerainty on Scotland, Cumberland, and Wales; and the kingdom of England was formed.

At the beginning of the 11th century a turn of fortune substituted a Danish for a Saxon king. Under Knut (1016-25) England formed part of the extensive northern Empire which comprised Denmark and Norway and included in its sphere of influence the rest of Britain, Sweden, and the Baltic coast-lands. Once this Empire broke up, the kingdom of England again came under the sway of the kings of Wessex. As thus constituted, it was conquered by William the Norman in 1066, since when it has always remained a single unit.

The Anglo-Saxon kings introduced local subdivisions into the political unity which they created. It was they who during the process of unification created most of the English shires, an arrangement which, in spite of economic changes, has lasted for centuries. Certain large towns or county boroughs have been detached from their shires for administrative purposes, but the ancient shire, or county, still remains the chief territorial subdivision in England, the special case of London being alone excepted. It is a familiar idea in men's minds and holds a strong place in tradition and custom. In France the territorial subdivisions are often denoted by the old provincial names as well as those of the modern 'departments'; but in England there is no rival to the county.

Yet it is beginning to be felt that the old subdivisions are no longer suitable to the new grouping of population caused by urban and industrial developments, and there have been suggestions for creating administrative areas which would coincide with the main centres of economic life. Instead of the existing fifty English administrative counties, it has been suggested that there should be only about a dozen large areas centring on Newcastle, Leeds, Manchester, Birmingham, Nottingham, Bristol, Plymouth, Southampton, Cambridge, Norwich, and London.

The idea of a uniform division into shires or counties sprang from that of political unification. The Norman kings of England definitely established the unity of the country, which before their time had been uncertain. William's conquest was of a different character from that of the Anglo-Saxons. The infusion of French blood was weak, except in the upper classes of society. The contribution of the Norman Conquest, viz. the rule of law and order, was a product of Roman civilisation. This principle became the basis of the

central government, the instrument of political unification. Royal officials travelled through the country, assessed its wealth, and drew up a list of estates with their population, arable land, woods, pasture, and mills, and used the facts thus collected for the compilation of the unique document known as the Domesday Book.

The fusion of the nation's strength was achieved by internal agencies. From the conversion of the Anglo-Saxons to Christianity in the 7th century, the Church in England assumed a special character, which placed it in closer relation with the country districts than with the towns. It established its bishoprics in villages, recognised the religious supremacy of Canterbury alone, showed an inclination to rebel against the influence of Rome, retained the vernacular in its ritual, fervently venerated the native saints and celebrated their festivals, and was attached to national traditions. The spirit displayed by the Church was perhaps one of the first manifestations of national consciousness. A like solidarity was shown in the progress towards the development of a national language. At the end of the 12th century English displaced French as the medium of conversation among the upper classes and was on the point of supplanting it in official use. In 1363, pleas before the King's Bench ceased to be heard in French.

The consolidation of English unity, which was accomplished between the 13th and 16th centuries, was greatly favoured by geography. Since the Norman conquest there have been no foreign invasions. Unlike France, the country has not been forced to expand to and defend its natural frontiers. The island has but one political authority, one predominant language, one prevailing cultural system, one national organisation. England gave up her Continental possessions in Normandy and Aquitaine, and turned to an internal expansion which ended in the occupation of Ireland and in union with Scotland. When she was complete mistress of the island, she became an impregnable fortress protected by the sea. The whole process of unification was accomplished without the possibility of foreign intervention of a lasting and effective character in favour of refractory elements. At an early date the political centre was established in London, where it could be reached only with difficulty by an enemy advancing from the sea, and where it was in the midst of a great commercial focus whose wealth supplied the Government with the means of material power.

3. SCOTLAND

The name Scotland, whether in its Latin form *Scotia* or in its modern Germanic variant, was applied at the end of the 10th century

to only a part of the Scottish territory of the present day. It is of foreign origin and was derived from the tribal name of the Scots who dwelt in the modern county of Antrim in northeastern Ireland. Towards the beginning of the 6th century A.D., this tribe migrated to what is now the county of Argyll in western Scotland. Its migration from Ireland opened the way for the spread of Christianity, and about the year 563 St. Columba set sail from Ireland and landed on the island of Iona, which he made the starting-point of missions to Scotland. As soon as the new faith reached Scotland, it spread so quickly that in a short time the whole region north of the Clyde and Forth became one big spiritual community. In the 9th century St. Columba's remains were transferred from their isolated position in Iona to Dunkeld, on the border-line of the Highlands and the eastern Lowlands, and in consequence this town became the ecclesiastical capital of Scotland. Thus, the idea of Scottish unification was first sketched out under the influence of the Scots from Ireland. But it was an experiment in political as well as religious unity, for about the year 843 Scottish princes succeeded in collecting under their authority all the inhabitants of northern Scotland, who were probably also of the same racial origin.

This early Scottish kingdom had its centre of gravity in the west, that is, in Celtic territory. Its development into a powerful state was due to the Germanic element which had shifted the focus to the east. Anglo-Saxon tribes had gained a foothold in Scotland to the south of the Tweed and had gradually moved northwards along the coast to the Forth. There in A.D. 630 Edwin, King of Northumbria, had built the fortress of Edinburgh as a defence against the Celtic-speaking Scots. Little by little, the Anglo-Saxon elements filtered northwards and founded settlements in the modern counties of Lothian, Fife, and Forfar, and around Aberdeen, all of which were situated in the dominions of the king of the Scots. This Germanic element was destined to become the nucleus around which the power of the Scots rallied. Geographical conditions favoured the development. The east had a less raw climate than the west and offered the advantages of fertile lowland and nearness to the North Sea. It soon prevailed over the infertile, wild, and foggy west by means of its abundant harvests, populous countryside, and its towns ; and it became the vital centre of the country. Hence, as has been said above, in the 9th century the Scottish kings moved their religious shrine and political capital to Dunkeld, which lay in the heart of the Germanic settlements. The true believers and subjects who gathered round them there were gradually won over to Germanic culture, the Roman Church, feudal customs, and the English

PLATE XV



[Photo: A. Demangeon.
A HOLYCROSS ABBEY, NEAR THURLES,
IRELAND

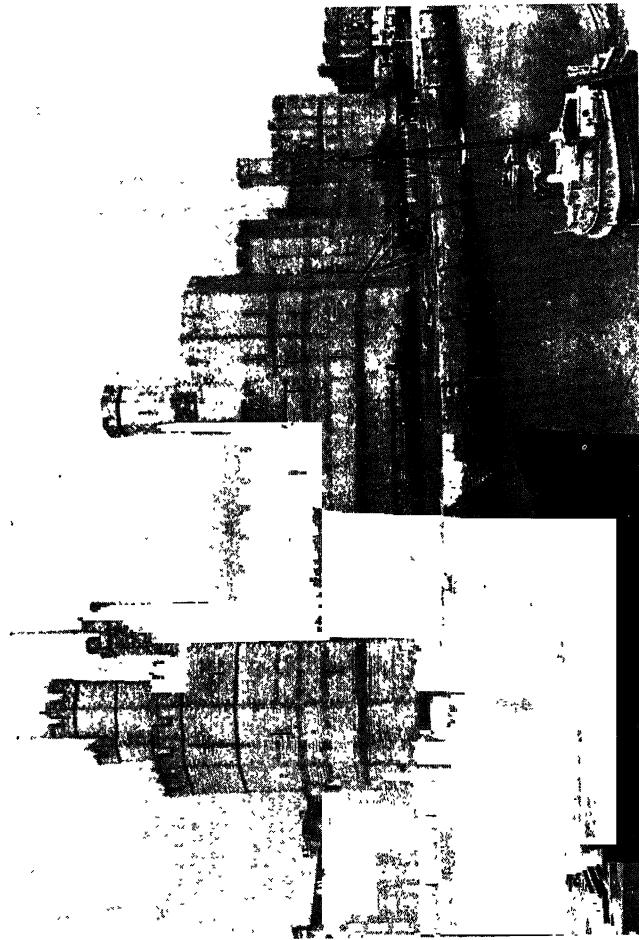
[Photo: A. Demangeon.
B. THE CATHEDRAL AT IONA IN THE
INNER HEBRIDES



C. YORK
Bootham Bar with a part of the old walls. The towers of the Minster can
be seen in the background.

[To face page 102.]

PLATE XVI



[Photo: Will F. Taylor.]

CAERNARVON CASTLE

The Eagle Tower stands on the left, with the River Seiont in the foreground.

language. As early as the 10th century, even the English elements in the Scottish kingdom assumed the habit of calling themselves Scottish and their country Scotland. So at that time there existed in Britain two English kingdoms, each backed by a Celtic territory : the kingdom of England, with its capital in London, had its Welsh and Irish areas, and the kingdom of Scotland, with its capital at Dunkeld, Dunfermline, or Stirling, had its Celtic Highlanders.

Hardly had the kingdom of Scotland been consolidated in its isolated peninsula behind a defensive barrier of mountains than it became hostile to England, and a border warfare began, which lasted for centuries. Its essential object was to gain possession of the fertile plains of the eastern Lowlands. The ebb and flow of war left the frontier undefined for long years. The natural routes which follow the coast past Berwick and Dunbar constantly witnessed the march of armies. After two centuries of strife and argument the frontier between the kingdoms was drawn in the middle of the 13th century through the almost uninhabited area of the Cheviots and has remained fixed there. But right into the 17th century there still persisted a chronic state of war, of raids and forays, which kept the Border in a perpetual state of alarm.

The existence of the two kingdoms of England and Scotland in the same island raised the question of supremacy. Though England was stronger and had a larger population, she had great difficulty in absorbing Scotland, for her base of operations was too far away. At the end of the 18th century London was four and a half days' journey from Edinburgh by road in winter, and this handicap was all the greater in the Middle Ages. Scotland was therefore able to preserve her freedom and develop that individuality which resulted from the close association and unity of Highland and Lowland, of plain and mountain. The Scottish nation grew and expanded into a single state comprising a variety of components. It had its own literature, its own Reformed Church, its own foreign policy, and its own economic interests. Consequently, when the chances of the laws of succession called James, King of Scotland, to the throne of England in 1603, Scotland could not entertain the idea of union with England ; and the two countries remained independent, each having an equal status under the same crown and treating the other as a foreign nation.

Under the pressure of economic necessity at the beginning of the 18th century the geographical, religious, and linguistic ties which already existed between England and Scotland became political bonds as well. In 1707, the two countries united by common accord into a single realm, the kingdom of Great Britain, with the same sovereign, the same Parliament, the same customs union.

From this time the rivalry of the extensive Scottish trade in the Netherlands ceased to be a trouble to the merchants of London. On the other hand, the English markets in Europe and the colonies were opened to Scottish enterprise. Thenceforward, the two countries joined in expanding and exploiting the British Empire. Scots were found in the van of colonisation, whether as pioneers in the Northwest of Canada, as trappers in Hudson Bay Territory, or as squatters in Australia. Richardson and Ross, who are famous for their polar expeditions, were Scots, as were also James Bruce, Mungo Park, Alexander, Livingstone, Mackenzie, Fraser, and Grant, the achievements of which last greatly furthered our knowledge of Africa.

In spite of the collaboration of the two kingdoms in Britain, Scotland cannot be said to have fused with England. Although deeply loyal, she none the less retains her national pride, and no Scot likes to be called English. Scottish peculiarities survive in political institutions and in local government. When the British Parliament passes a general law it must pass one Act for England and Wales and another for Scotland. The Government of Great Britain includes the Secretary of State for Scotland in the Cabinet and three other representatives of Scotland outside that body. Scotland has its national Presbyterian Church, to which belong two-thirds of the population. State education in Scotland is largely in the hands of the local authorities. The Scottish Court of Session has its own legal code, and there are special government departments for agriculture and fisheries, and for geology. Thus, Scotland keeps certain elements of self-government. Lastly, she still retains, especially in the mountains and islands of the west, a number of people who speak the old Gaelic language. In 1931, there were 130,080 persons who spoke both English and Gaelic, and 7,069—or 0·15 per cent. of the population—who spoke Gaelic only (see Fig. 42).

4. WALES

The Welsh are isolated by the peninsular and mountainous nature of their country, and, in contrast with the neighbouring lowlands, Wales still remains to some extent a Celtic land. As in Scotland and Ireland, the English occupied the plains, whilst the Celtic Welsh took refuge in the hills. In the 6th century A.D. the country was occupied by Celtic-speaking tribes belonging to the great confederation which extended from the Clyde to Cornwall. Originally independent, these units formed a loose confederation which gained national consciousness in the face of Anglo-Saxon menace, and this consciousness was reflected in the name Kymri

(= fellow countrymen) which the tribes applied to themselves. On their side, the Anglo-Saxons termed them Welsh (= foreigners).

But the onslaught of the Germanic tribes broke up the Kymric confederation. The Welsh group was cut off from the Cornish in the year 577 and from the 'Scottish' group in 613. Thenceforth, it was surrounded and besieged in the peninsula, recoiling in every direction before the Germanic advance. By the beginning of the 12th century the south had submitted to the English. The north resisted for some time longer, maintaining its existence as the

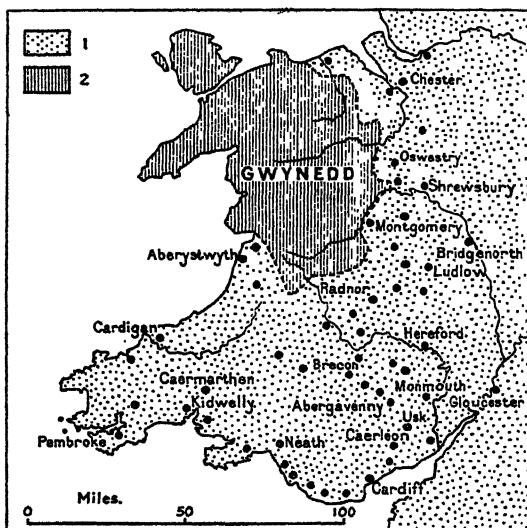


FIG. 30. A Stage (about 1135) in the English Conquest of Wales.
(After Poole.)

1. The conquered area, with its Norman castles.
2. Gwynedd, the last stronghold of Welsh resistance.

native kingdom of Gwynedd in the natural fortress of Snowdonia (see Fig. 30). But the last vestige of resistance was overcome at the end of the 14th century.

The English conquest of Wales was not the result of migration, nor did it take the form of colonisation, but rather that of military occupation. This fact is demonstrated geographically by the development of urban settlement. The Anglo-Norman barons established their authority in Wales by building castles at strategic points chosen with a view to concentrating their defence and keeping an eye on the countryside. The stages of the conquest can be followed by the series of fortresses which are dotted about on the Welsh marches, in the valleys, and on the coast. Under

shelter of the castles towns sprang up and were peopled by artisans and traders from England. The chain of towns formed the framework of Anglo-Saxon hold on the country. They included Monmouth, Hereford, Shrewsbury, Chester, Caernarvon, and many others, which held the country in a vice, just as the French towns in Brittany have dominated the Armorican Peninsula.

Unlike Scotland, Wales has never been an independent state. Geographical factors seem to have been against it. The country has no natural focus ; its valleys open out eastwards ; the two great routes which cross it run along the coast and are separated by the whole breadth of the peninsula. Even to-day communication between the north and south is difficult. Yet, in spite of all this, there is no region in the British Isles, except Ireland, which contains the germs of nationality so strongly as Wales. A third of the population still speaks Welsh. In 1911, there were 787,074 persons, or 32·5 per cent. of the population, who spoke Welsh as well as English, and 190,292 spoke Welsh only, a percentage of 7·9.

The Celtic dialect spoken in Wales is more closely related to the old Cornish and Breton languages than to the Gaelic spoken in Scotland and the Erse in Ireland. It formerly spread over a far wider area than it does to-day, for Celtic place-names swarm in the counties of Monmouth, Hereford, Shropshire, and Flint ; but in face of the Anglo-Saxon onslaught it was gradually pushed westwards. At the end of the 18th century an influx of English workmen into the industrial counties of the southeast overwhelmed the villages of Monmouthshire, where Welsh was still holding out. During the 19th century English was spread by the elementary schools, and it also flooded into the commercial centres and seaside resorts. The percentage of Welsh-speaking people fell from 80 in 1901 to 32·5 in 1911. The language still survives in the northwest, where nearly four-fifths of the population understand it.

Is it fated to disappear ? About the year 1785 a slight revival took place through the agency of the Methodists, who founded itinerant schools in which the Bible was taught in Welsh. The sermons of their preachers inspired new vigour into the sap of the failing tree. Just as economic developments had favoured the spread of English, so religion by its prayers and sermons gave strong support to the native tongue. The persistence of the language among the masses and the renewal of its vigour owing to religious teaching, together with a study of the old landmarks of literature and native history, have given rise to a Welsh nationalist movement. Many cultivated minds take delight in turning to the past with its evidence of the traditional peculiarities of the little nation. The University of Wales, with its colleges at Cardiff, Aberystwyth,

Swansea, and Bangor, lays special stress on research in and teaching of the archaeology, history, geography, folk-lore, language, and literature of the country. The idea of a Welsh nation is once more taking form in men's minds, and, as in Scotland, the conception of a federation of states in Great Britain, which would give Wales a greater share of freedom and self-government, is spreading through the land.

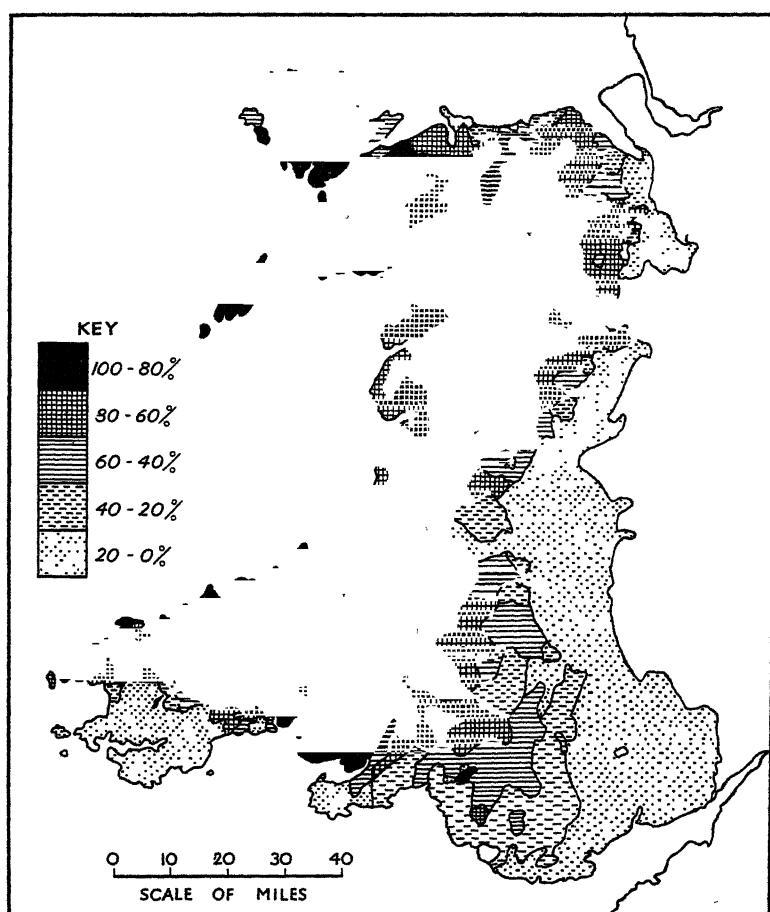


FIG. 30A. Distribution of Welsh-speaking people.

5. IRELAND

The position of Ireland with respect to Britain must be regarded as one of the strongest influences which have affected the destinies of the island during the past centuries. The two islands lie close together, but Ireland, the smaller, is far removed from other lands. Towards the west she looks across the desert of waters ; towards the east her relations with the Continent are dominated by Britain. She seems to be overshadowed by her neighbour ; and yet this neighbour feels her to be too close to allow her to be a matter of indifference. Hence, the historical development of Ireland has been almost wholly dominated by English influence, and the island was England's first great colony.

At the same time, the domination of Ireland by Britain was not an original consequence of geographical proximity, but was due to the comparatively recent impact of a Germanic race on a people with a Celtic civilisation. Age-long isolation in an island seems to have given rise to a special cultural development in the Celtic communities in Ireland. For centuries the island was a centre of civilisation with an independent and vigorous life of its own ; and during that period this offshoot of the Celtic-speaking peoples was endowed with intense vitality and brimmed over with energy.

In the distant past Ireland was a centre of expansion from which leaders and men streamed into the neighbouring countries of Scotland and Wales. A refined and cultured civilisation developed in her during primitive times. By the 5th century an extensive and missionary Christian Church was taking shape in it at a time when Britain was still heathen. The monasteries established at Armagh, Clonmacnoise, Clonfert, and Lismore became cultural centres, to whose schools men journeyed from afar to study science, literature, philosophy, Greek, and theology. Irish scholars knew and taught that the Earth was round, and it was perhaps an Irishman who first discovered Iceland. In the 5th, 6th, and 7th centuries missionaries set out from these monastic schools to visit Western Europe. One of them, Columba, founded the monastery of Iona (see Plate XV, A and B) and converted the barbarous Pictish inhabitants of Scotland. St. Columban founded Luxeuil and Bobbio ; St. Gall and St. Kilian travelled in Switzerland and western Germany. Kormac settled in Iceland, and when the Norse rovers reached that island towards the end of the 9th century, they found Irish priests there. Irish scholars frequented the courts of Charlemagne and Charles the Bald. When it is remembered that Ireland was the only country in Western Europe which was not conquered by the

Romans, it will be understood that, until her conquest by the English, she would be marked by special characteristics, and that the conquest which brought her within the world of Germanic culture was indeed a radical upheaval.

The relations between the English and the Irish form a chapter in English colonial history. There were two periods of colonisation, each being of a distinct character. One of these occurred between the 12th and 16th centuries, the other between the 16th and 18th. In the earlier, which began in 1170, the military element was represented by bands of adventurers from Wales and the Welsh Marches, whilst the colonist element consisted of traders from Bristol and Chester, monks, artisans, and farm labourers. The expeditions, which began as private ventures, soon found the support of the king. In 1171, Henry II consolidated the first settlements by planting garrisons in Cork, Waterford, Limerick, and Dublin—all of them on the coast. But after the 14th century no further emigration to Ireland is recorded, and the English colonies ceased to be maintained by new arrivals. The handful of settlers and soldiers could not think of driving out the natives or even of gaining control of the whole island, but contented themselves with exploiting it commercially amid conditions which were often precarious. They kept a strong hold on the coast at fortified points which enabled them to communicate easily with their homeland. The richest and largest of these bases was Dublin, which dominated an area known as the Pale. The limits of the area contracted or expanded with the ebb and flow of the struggle with the natives. Beyond the Pale dwelt the Gaels with their own social organisation, culture, and mode of life. After three centuries the Anglo-Irish nobility assumed the manners, dress, and language of the Irish chieftains, and fusion of the two peoples proceeded at such a rate that by the 16th century the English element had almost disappeared from the country districts and survived only in the ports of Limerick, Waterford, Cork, and Dublin. The early settlements thus disappeared for want of reinforcement.

At the end of the 16th century economic conditions in Britain forced many of the countryfolk to emigrate from that country. The emigrants turned towards Ireland in search of land to cultivate. The result was not an occupation of the country by soldiers, traders, and big landowners, but a real colonisation—to use the term employed by the English in Ireland, a 'plantation.' The settlement of these farmer-colonists, by creating a close bond between the settler and the soil, proved to be the only solid and permanent Anglo-Saxon colonies in the country.

The most vigorous and numerous of the plantations were formed in Ulster. Parties of Scottish adventurers had during the 16th century passed into Ireland across the narrow channel which separates the Mull of Kintyre from the headlands of Antrim. From the beginning of the 17th century emigration had been systematic.

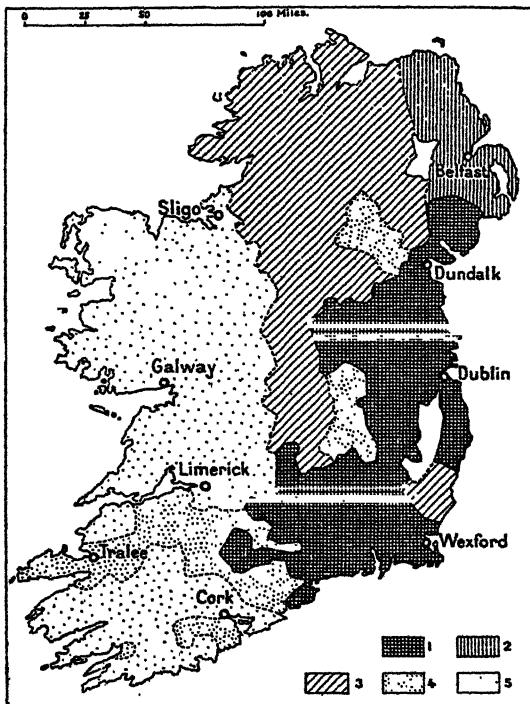


FIG. 31. A Stage in the English Conquest of Ireland, about 1641.
(After Poole.)

1. The Pale, or area firmly occupied by the English towards the middle of the 16th century.
2. Area occupied by free settlers from Scotland up to about 1586.
3. 'Plantations' effected in the reign of Elizabeth on areas confiscated from native owners up to about 1603.
4. 'Plantations' effected in the reign of James I.
5. Area which remained in the hands of Irish chieftains.

cally organised by the Crown. The accession of James I to the throne of England extended the movement to Scotland, and thousands of emigrants from the uplands near Aberdeen and Inverness settled in Counties Down and Antrim, where they occupied lands depopulated by civil strife, set up their homesteads, pastured their herds, and tilled their fields of corn and flax. The first arrivals

attracted others. In 1619, the number of families of settlers in Ulster was estimated at 8000 (see Fig. 31). Shortly after, when the chiefs of the Tyrone and Tyrconnell clans revolted, their vast estates were confiscated and distributed among Scottish and English landlords, who imported more settlers. In 1736, Ulster contained 62,624 families of settlers as against 38,459 Irish families. Half the settlers were concentrated in Counties Down and Antrim. Outside Ulster settlement took place in the King's and Queen's Counties, where colonisation was moderately dense by the beginning of the 17th century.

But Anglo-Saxon colonisation by the plantation method failed in the rest of Ireland, for it consisted of a mere transfer of property, not a movement of people. The great Irish landowners were dispossessed for the benefit of others from Britain. This settlement, which was accomplished partly through the bloody struggles of the Commonwealth and the Great Rebellion and was hastened between 1633 and 1654 by the deportation beyond the Shannon of several tens of thousands of rebels, was rounded off in 1689 by the confiscations under William of Orange. The extensive lands which were confiscated passed into the ownership of officers, court favourites, officials, and companies formed for exploiting the country. A mere change of ownership took place, for the Irish peasant continued to cultivate the land, and he alone maintained contact with the soil. According to the census carried out in 1659 under the Commonwealth, for each English or Scottish settler there were six Irish in Leinster, ten in Munster, ten in Connaught, and three in Ulster. But at the end of the 17th century only one-sixth of the land remained in the hands of Irish landowners, and furthermore a large proportion of this sixth lay in the wild and barren districts of the west. Outside Ulster the Anglo-Saxon settlers were for the most part landowners, whilst the farmers, the people of the soil, were Irish peasantry. Consequently, there was a great rift between landownership and cultivation, between landlords and farmers. On the one hand, a few strangers owned the landed property ; on the other, the natives, who formed the vast majority of the population, tilled fields which they did not own.

Hence, the result of the second colonisation of Ireland was that two classes differing in origin and interests existed side by side in the country. The colonists owned the land, and the natives tilled it. The former nearly all adopted the practice of living on the country without living in it, the latter toiled for landlords whom they never saw. In short, the population of Ireland contained two distinct sections which were opposed to each other not only through their material interests, but also through the fervour of their

beliefs, for the colonists were Protestants and the natives Roman Catholics.

The Anglo-Scottish colonisation has left a deep impression on Irish life. It has given rise to the present territorial division of the country into thirty-two counties, whose arrangement is reminiscent of the stages and troubles of a difficult colonisation and is the result of political enactments following on conquest. Anglo-Scottish influence has penetrated into Ireland culturally as well as politically. Most of the place-names are Gaelic or Norse, but the language has

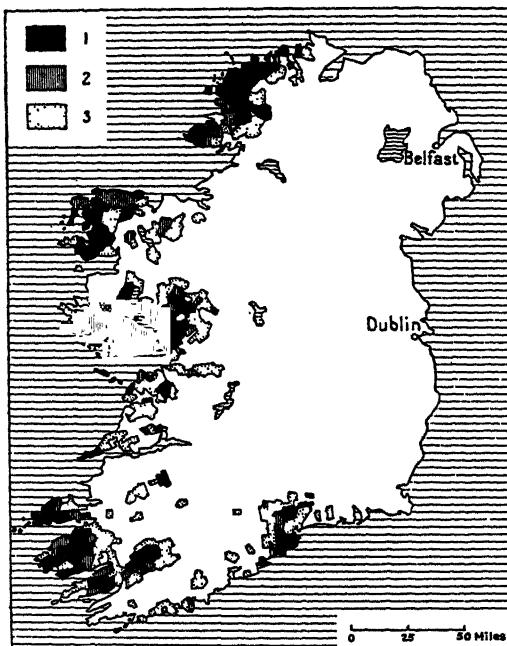


FIG. 32. Distribution of Gaelic-speaking People in Ireland.
This figure is based on the census of 1926.

1. Areas in which more than 80 per cent. of the population speak Gaelic.
2. Areas in which between 60 and 80 per cent. speak Gaelic.
3. Areas in which between 30 and 60 per cent. speak Gaelic.

been steadily ousted by English, this being the medium of commerce and modern civilisation.

In the middle of the 19th century the mass of the people outside the towns still spoke Gaelic. Statistics for 1911 show that in the whole of Ireland, excepting Dublin and Belfast, 551,374 persons spoke both English and Irish. This figure represented a decrease

of 70,758 on that of 1901. The rest of the population, rather more than four millions, spoke English only. The number of persons who spoke Irish only was reduced to 16,841. These lived mainly in Counties Galway, Donegal, Kerry, and Mayo. Since 1880 there has been a revival of Gaelic, which has aimed at spreading the use of the old language of the country. The Gaelic League, founded in 1893, instituted courses in Irish ; the Government of the Free State made the teaching of the language in the elementary schools compulsory and assured it an honourable place at the University. Many Irishmen hold that a nation without a language is a nation without a soul. The efforts to revive the language have had an appreciable effect, for whereas in 1911 only 17·6 per cent. of the population of the present Free State spoke Gaelic, in 1926 the percentage had risen to 18·3. Since that date there has been further progress owing to the efforts of the Free State Government. The number of shop-signs and placards in Gaelic has increased. Many of the official documents of the Free State are couched in that tongue ; and, although the Constitution recognises English as a subsidiary official language, it declares Gaelic to be the national and chief official language.

It is to be hoped that Ireland will not isolate herself through the use of her ancient tongue and will not throw away the advantages of the possession of so universal a language as English. However much patriotic sentiment may urge the preservation of the national tongue as a bond of unity, the whole economic system of Ireland demands a knowledge of English.

The basis of national consciousness is, indeed, not the Gaelic tongue, but the Roman Catholic faith. From the 17th century onwards every Anglo-Scottish settler was a Protestant. British colonisation did not clash with national sentiment when it penetrated among the clans ; but it created that sentiment by introducing Protestantism. The Irishman may discard his language, but he holds to his religion. It is the number of Roman Catholics, not the count of Gaelic-speaking persons, which gives the measure of the survival of Irish ideals. Since the 18th century there has been a Protestant majority in Antrim, Down, Derry, and Armagh only. Nor has the situation greatly changed in Ulster. Of the six counties which now form Northern Ireland, Tyrone, Armagh, and Fermanagh are equally divided between the two sects ; but, on the other hand, there is a Protestant majority in Counties Down, Antrim, and Derry, as well as in the towns of Belfast and Londonderry. The percentage of Protestants in Northern Ireland is 66 ; but in Ireland as a whole the percentage of Roman Catholics is 75. This preponderance of Roman Catholics is due especially to the

country districts, where the percentage is 80, rather than to the towns, where it is only 60. The Irish nation consists of the mass of Roman Catholic peasantry, whose national sentiments are derived from their love of the soil and their loyalty to their faith.

Though Irish national consciousness is of long standing and associates many moral forces with a variety of material interests, it has given rise to an independent state in recent years only. From the 12th century onwards Ireland was a political dependency of England and the property of the Crown. At first the English kings styled themselves 'Lords of Ireland,' but in 1542, Henry VIII assumed the title of King of Ireland. During two short periods this form of relationship was suspended. The first occurred when the Commonwealth annexed Ireland in 1652, and the second when the island became temporarily free in the reign of James II. The state of dependence was then revived for more than a century. But from 1782 to 1800 Ireland was recognised as an independent kingdom united to Great Britain by the bonds of common sovereignty. After a stormy experience of freedom, she became once again an integral part of the United Kingdom of Great Britain and Ireland at the beginning of the 19th century, and this relation continued until 1921, when the Irish Free State was established.

This event marked a turning point in the long struggle for political independence. The Treaty of 1921 seemed to be a victory for Irish nationalism ; but at the same time it was not a dismemberment of the British Empire, since its provisions formed part of the normal development of imperial evolution. As a consequence of the war of 1914-18, the Irish question assumed for Great Britain the aspect of an imperial problem. If the Empire was to become a federation of Dominions, it seemed natural that the United Kingdom should itself share the reorganisation into self-governing countries, and for Ireland, like other parts of the Empire, to become an autonomous Dominion. Consequently, the Treaty of December, 1921, which settled the relations between Great Britain and Ireland, conferred on the latter the status of a Dominion of the British Empire. She became, within the framework of the Empire, a Free State owing allegiance to the Crown and taking the oath to the King. Through her Parliament and her Government the Free State kept control over her own domestic affairs. But owing to her special position in relation to Great Britain, certain limits were imposed on her freedom in foreign and naval affairs. The Irish Free State was officially established by royal proclamation on December 6th, 1922.

Under this new arrangement the Free State continued her efforts to win complete freedom. In 1932, its Government assumed control of its foreign affairs and now maintains its own legations in the great capitals of Europe. The King is no longer represented by a Governor-General, the traditional oath has been discarded, and no representative of the Free State Government was present at the coronation of King George VI in 1937.

By a Constitution passed by the Dail on December 29th, 1937, the Free State seems to have rejected the status of Dominion. This Constitution, unlike that of 1922, has not been authorised by the King and promulgated by the British Parliament, but is a new system of government which the Free State has drawn up for itself. It repudiates the name Free State, substituting that of Eire ; it proclaims that Ireland is an independent sovereign state ; and it makes no mention of the King. Similarly, nothing in the text of the Constitution indicates that Eire is still a member of the British Commonwealth of Nations, except an allusion in Article 29 which permits Eire to join in any group or association of nations and to co-operate with the members of that group for the solution of international problems in the common interest.

A trade agreement made by the two countries on April 25th, 1938, settled most of the differences which had existed for six years between the two countries. It increased the independence of Eire still further and entrusted her with the defence of her own shores, with the assistance of the British Navy. Following this agreement the Admiralty handed over to the Free State Government the naval bases which it had maintained, under the terms of the Treaty of 1922, at Lough Swilly, Cork, and Berehaven. This concession, which was intended to conciliate the Irish, proved costly in English lives during the German War of 1939-45 when Eire remained neutral. To-day the partition question alone remains unsettled.

The Free State, with its capital at Dublin, covers an area of 26,600 square miles and has a population of 2,949,000 souls, of whom 2,750,000 are Roman Catholics. Northern Ireland has its capital at Belfast, occupies an area of 1375 square miles and contains 1,279,000 inhabitants, of whom 850,000 are Protestants. As delimited in 1922, it includes six counties ; but in several of these are large groups of Roman Catholics, who amount to 56·2 of the population in Fermanagh, 55·4 per cent. in Tyrone, 45·3 per cent. in Armagh, and 45·8 per cent. in Derry. As the Free State claims these Roman Catholic areas—at least those adjacent to its territory—the boundary between the two sections of the country is disputed at certain points (see Fig. 39).

PART II

REGIONS OF THE BRITISH ISLES

CHAPTER V

IRELAND

1. RELIEF

EXCEPT in the short stretch between Dublin and Dundalk, Ireland presents a mountainous appearance from the sea. But, in fact, the mountains and hills are clustered in the north and south, leaving in the centre of the country a wide, low plain across which it is possible to travel from Dublin to Galway without meeting any great irregularities of surface.

THE MOUNTAINS. In Ireland the mountains do not form compact masses or continuous chains, but are cut up and subdivided by valleys, depressions, and strips of lowland. In the south the route from the Central Plain to the coast along the Barrow, Suir, and Blackwater Rivers shows no appreciable changes of gradient. In the north the whole country from Donegal Bay across the entire breadth of the island to Dundalk Bay is broken up into little, isolated clusters of hills by a close network of river-valleys and lake-filled hollows. Consequently, the relief of the island is divided into a number of separate units, each with well-marked peculiarities and, as a rule, very distinct appearance and topography.

In the east, between Dublin and Wexford on the one hand and the valleys of the Liffey and Slaney on the other, rise the Wicklow Hills, which are composed of sandstone, quartzite, schists, and granite and attain to over 3000 feet in Lugnaquila. Owing to their closeness to Dublin they are well known and are frequently visited on account of the grandeur and charm of their scenery. Blunt, heather-clad summits rise above slopes marked by a confusion of erratic blocks and morainic hills left by ancient glaciers, and above wild gorges along whose bottoms flow the Dargle, Vartry, and Liffey. Here and there appear the bold, abrupt forms of lofty quartzite benches and conical or sugar-loaf hills, towering above the gentler features of the ancient mountains. Among these wilder hills lies the delightful vale of Ovoca (see Plate XVIIA), whose waters glide between ivy-mantled, moss-grown rocks and through glades of beech, oak, and larch.

In the southwest the mountainous character increases in the hills of County Cork and even more in those of Kerry, where perhaps

the most grandiose features in the whole of Ireland, viz. the mighty bastion of Carrantuohill (3414 feet), the highest peak in the island, the gigantic terraces of Macgillicuddy's Reeks, the wild precipitous corries of the Killarney district which still bear fresh marks of glaciation, and the rocky wave-battered headlands, have been carved in thick layers of Old Red Sandstone (see Plates IX and XVIIIB).

Powerful glaciation has given greater uniformity and severity to the relief of northwestern Ireland. Nothing wilder or more desolate can be imagined than the uplands of Connemara and Mayo with their dark mantles of heather, their deserted valleys, their bogs, their innumerable lakes, their corrie-sharpened ridges, their bare slopes so polished by ice that they shine like glass when the sun strikes them. Only here and there rise bold peaks, which are sometimes conical quartzite hills like Croagh Patrick (2510 feet), Slievemore, and the Twelve Pins ; and at other times tabular sandstone heights like Muilrea (2688 feet). The crystalline rocks of Donegal give damp, regular, peat-covered surfaces which call to mind those of the Highlands of Scotland. Above these desolate forms occasionally rise the vigorous features of some mass of quartzite like Mount Errigal (2466 feet ; see Plate XVIIIA), Slieve Bloom, or Aghla.

Greater variety in geological structure gives a less monotonous appearance to northeastern Ireland. Whilst the rest of the island contains no sediments subsequent to the Carboniferous, Ulster has been more recently submerged, and the less resistant sediments laid down in this area have given rise to the wide, open valleys of the Bann, Blackwater, and Lagan. Owing to this, a variety of rocks outcrop near each other. There are sandstones and Triassic marls which contain the Carrickfergus pockets of rock-salt ; Jurassic clays scarred by picturesque land-slides along the coast ; and chalk strata whose white cliffs are capped by black basaltic lava-flows (see Plate IIIA). A layer of basalt, which is at times about 1000 feet thick, forms the surface of the plateau farther inland. Between the beds of this volcanic rock the phases of rest in the process of eruption are marked by layers of iron ore which are worked at Glengariff, and of bauxite—the raw form of aluminium—which are worked at Ballintoy.

A rift—the only one of its kind in Ireland—in the basaltic plateau of Antrim contains Lough Neagh, the largest lake in the British Isles, whose surface measures 154 square miles. Whilst other Irish lakes are arranged in lines or groups, Lough Neagh lies isolated in a plain between alluvial shores occupied by cultivated fields and meadows. On the coast the sea has carved in the basaltic beds

wonderful cliffs with wild chines, natural arches, stacks, columnar benches, and mysterious caves which echo the roaring of the waves. The separate lava-flows are marked in the lofty wall by a series of ledges. Scree are piled up in a confusion of boulders and rock-fragments. Lower down at sea level octagonal prisms of basalt form those geometrical rows of columns and pavements for which the Giants' Causeway is famous (see Plates IIIB and IVA).

THE CENTRAL PLAIN. In contrast with the picturesque grandeur



FIG. 33. Limestone Areas in Ireland.

1. Limestone areas. These will be seen to coincide almost exactly with the plain.
2. Non-limestone areas.

of the mountains, the centre of Ireland is occupied by a flat, slightly undulating plain in which the streams wander from lake to lake and from bog to bog so sluggishly that the eye cannot distinguish between running and stagnant water. Over a length of 100 miles and a breadth of 50 miles, the ground seldom exceeds a height of 300 feet, and the waters of adjacent basins sometimes mingle. Between the Liffey and the Barrow and between the Barrow and the Shannon, for instance, there is no perceptible watershed.

The topography of the Central Plain is to a great extent determined by the soluble, unresistant horizontal beds of limestone of

which it is composed (see Fig. 33). Sometimes, as in the Burren district in County Clare and in the neighbourhood of Ennis, its extensive outcrops form barren, desolate surfaces of naked rock which are cut up into rough boulders by clefts and fissures and are like the Causses and Garrigues of southern France, though they are without the sunshine of the Midi (see Plate XIXA). The jointed, permeable character of the limestone lends itself—especially in the western counties of Clare, Mayo, and Galway—to a remarkable development of karstic formation, with underground streams, swallow holes, grottoes and caverns, and a surface riddled with holes and depressions. Sometimes these depressions, which are known locally as *sluggas* or *sluggys*, are mere hollows whose bottoms are nearly always dry. At other times they are *turloughs* or blind loughs, that is, lakes whose surface level varies, filling up or emptying through the bottom according to the oscillations of the water-table. In winter they overflow on to the fields and meadows ; but in dry summer weather the cattle which drink from these lakes in winter are forced morning and evening to seek water several miles away. Such periodic lakes swarm in Ireland.

In the rock itself drainage is effected through a whole system of underground channels. A remarkable example of this subterranean flow of water is found in the limestone isthmus which separates Loughs Mask and Corrib in Connemara. This isthmus, which is three miles broad, has no visible watercourse, except the remains of an artificial canal which was dug to form a navigable channel between the two lakes, but which has proved useless, since the water escaped through the fissures in the bottom. There is an underground passage between the lakes, and the water reappears at Cong as a fine stream which flows through green pastures shaded by majestic beeches. The grottoes and caves made by underground water are among the natural beauties of Ireland and are particularly numerous in Counties Clare, Sligo, and Galway. Mitchelstown Cave in Tipperary has yielded valuable archæological finds of prehistoric man. The Marble Arch, situated some ten miles southwest of Enniskillen in Fermanagh, calls to mind, with its chimneys, tunnels, galleries, and vertical rock faces, the classic scenery of the Karst.

The Central Plain is so low and flat that the limestone is saturated right up to ground level and contains a greater number of lakes than many regions composed of impermeable clay. The water which always lies at the surface is a permanent agent of solution and is continually widening the lake-basins and river-beds. Hence the curious irregular and even fantastic expanses of water whose surfaces are dotted with swarms of flat islands. In many cases it is impossible to say whether these lakes are expanded reaches of the

streams or drowned portions of the Plain (see Plate XVIII B). Among the best instances may be quoted Loughs Allen, Ree, and Derg on the Shannon, Loughs Corrib and Mask at the foot of the

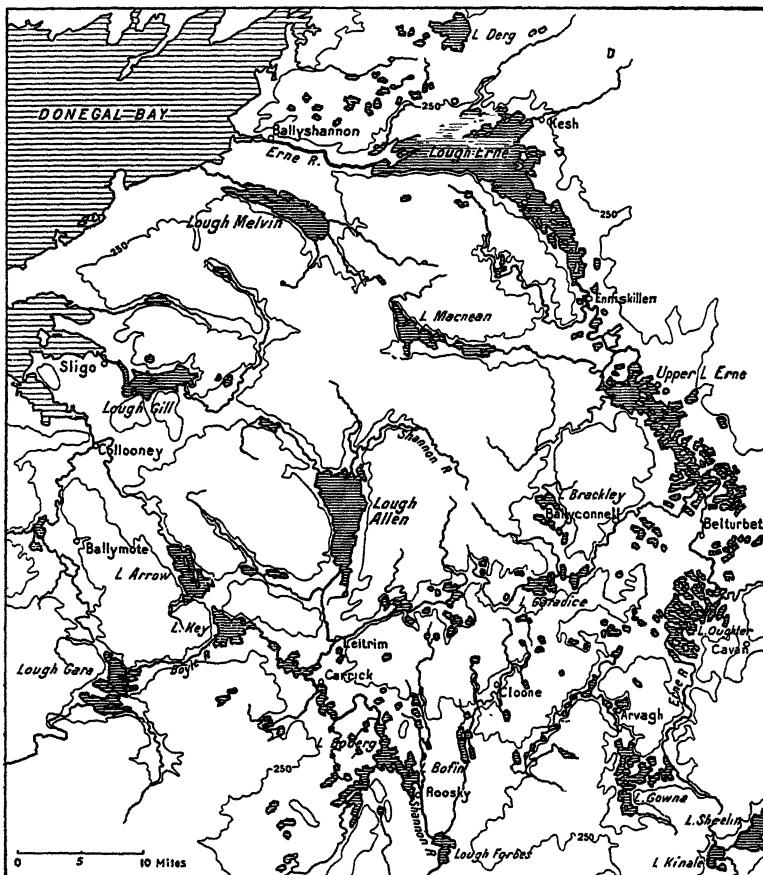


FIG. 34. The Lake District in the Basin of the Upper Shannon and near Donegal Bay. The land-surface is pitted with lakes, whose wide, irregular expanses are dotted with islands. Except Lough Allen, whose outline is fairly regular, the lakes all occur on the carboniferous limestone. The valleys are wide and meet at their heads without any appreciable water-parting. Relief is shown by the contour for 250 feet.

mountains of Connemara, and Lough Erne which empties into Donegal Bay (see Fig. 34). Taken as a whole, Ireland is a country of lakes, and one-fiftieth of its surface is under water. In Connaught this proportion increases to one-twentieth.

The Shannon may be described as a typical example of the Irish drainage system. It is the most important river, since its basin includes one-fifth of the whole island. It is the largest stream in the British Isles, having a length of 190 miles, without counting the estuary. Except in the short picturesque reach through which it passes near Killaloe (see Plate XIXB), it illustrates in the peculiarities of its course and system the characteristics of the plain which it drains. It rises in a little lake named Legnashinna, which is fed by an underground stream. Its gradient is imperceptible, falling 36 feet in the 110 miles between Lough Allen and Killaloe. The banks are ill-defined amid the lakes and bogs. Frequent sudden bends are caused by the indefinite channel which lies on a surface riddled with holes. The volume of the stream is astonishingly regular owing to the steady, plentiful rainfall and to the low gradient of its drainage basin, though a falling-off in summer is caused by the absorbent power of the peat in the surrounding country. Lastly, the series of huge lakes through which it passes forms a veritable barrier of water which from time immemorial has made the river the boundary between Meath and Connaught and has caused the latter province to be a kind of island isolated in the west of the mainland.

THE SOIL; PEAT. The landscapes of Ireland are not due to the influence of the structural rocks alone, but owe many of their familiar aspects to surface elements which form, so to speak, the mantle of the country. These are the covering of transported material and the shell of peat which mask the basement over nearly the whole plain.

Glacial deposits are widespread in Ireland and cover two-thirds of the land below the 1200-foot contour. The drift soils so formed, being friable and rich in lime, constitute some of the best farm lands in the island, whether or not they have been re-sorted by running water. Owing to their presence, the whole of the eastern portion of the Plain has always been the best cultivated and most densely peopled region in Ireland. It is crowded with megalithic monuments, battlefields, castles, and royal residences. On the western portion along the estuary and lower course of the Shannon stretch rich pastures with luscious grass which supports a large number of dairy farms. In other parts the Plain intrudes among the mountainous areas in broad tongues of fertile land such as are found in the valleys of the Lagan and Bann in Ulster, with their rich fields of flax ; the Golden Vale of Tipperary, whose soil has formed the wealth of the district between Cashel and Limerick ; and the inland and coastal lowlands in the counties of Cork, Waterford, and Wexford, whose warm, light soils have made them into the best

barley-growing areas in Ireland. These agricultural lands show traces of early human occupation, and the landscape is the result of cultivation. It is woodland and contains coppices of oak and ash, with an occasional beech. According to the locality, quick-set hedges, dry stone walls, or banks of earth surround the meadows and fields. But even when the hedges are fewer and the trees less closely set, the dominant tone is one of cool green. In this vapour-soaked, fog-bathed land mosses and ivy mantle the walls and stones.

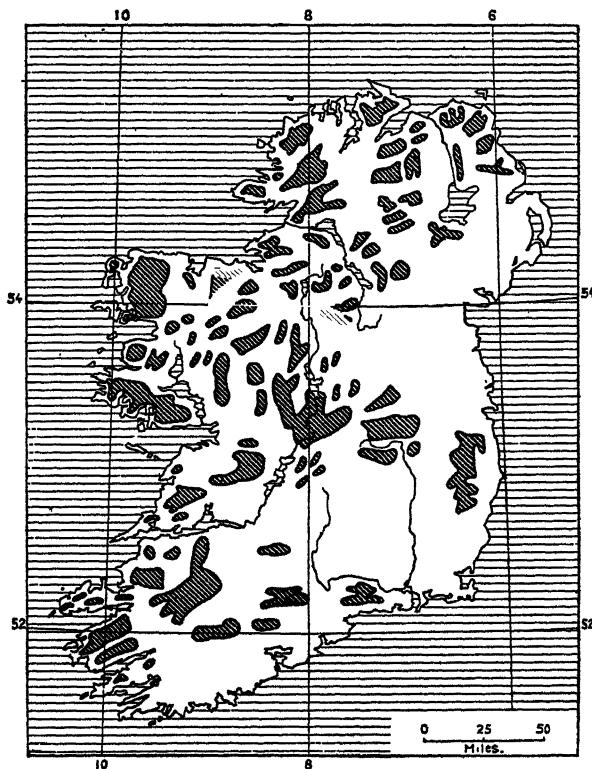


FIG. 35. Distribution of Peat Bogs in Ireland. The greatest expanses occur in the west, where they are found on mountain and plain alike.

The vegetation never disappears entirely, but forms a permanent garment for the Emerald Isle.

The peat bogs offer a strong contrast to these rustic woodlands and form the most peculiar element in the Irish landscape. They are found on mountain slopes and on the lower areas of the Plain, and cover one-seventh of the surface of the country. In some

counties the proportion is far greater, and more than one-tenth of Offaly, Longford, and Roscommon, and over one-half of west Mayo are under bog (see Fig. 35). The permanence and even the extension of existing bogs is favoured by the constant dampness of the air, the high rainfall, the great expanses of lakes in the lowlands, and the smooth shapes of the mountain tops. In Connemara peat occurs on very permeable soil, on pebbly deposits, and at all altitudes. But the greatest areas of peat bog are found in the Central Plain, where the vast Bog of Allen covers nearly 250,000 acres in Kildare, Offaly, and Meath ; and where a long trail of bogs follow the course of the Shannon from Lough Allen to Lough Derg. The thickness of the peat layer averages 20 or 30 feet, but sometimes reaches 50 feet.

Bogs are an essential feature in Irish scenery. In some parts it is possible to walk for days without losing sight of one. Their low, flat surfaces often stretch as far as the eye can see. So low indeed are they that to the south of Edenberry the Grand Canal rises above its surroundings. The desolate waste of reeds and heather in the dismal Bog of Allen is broken here and there by clumps of green aquatic grasses growing in pools of stagnant water or by meagre copses of pine, ash, and birch. Human occupation is marked by little patches of blackish earth in which potatoes grow in the peat itself, and by lonely roads fringed with ditches full of black water. There is no sign of the vivid green which has won for Ireland the name of the Emerald Isle, and the earth, the water, and even the houses are drab in colour.

In the mountains peat bog spreads everywhere. Between the heather tufts the ground is soft and squelches under foot. In this type of bog there are no trees to relieve the desolation, but pools and little lakes are of frequent occurrence, and here and there a lichen-clad rock appears.

Peat is an important factor in human life, for in this treeless, coal-less country it is the popular fuel, and its acrid smoke constantly hovers over man's dwellings. The winter supply is gathered every summer, and every hovel keeps a store of it. The long terraced trenches from which peat is dug and the stacks of little black cubes put out to dry are familiar sights (see Plate XXB). In some western districts the cutting of peat has been so intense that nothing now remains but a stony waste.

Peat fuel is an inseparable feature in Irish households, the annual domestic consumption of it being estimated at seven million tons. But it is valuable for other purposes. As it is heavy, brittle, and difficult to transport, attempts are being made to use it for industrial purposes on the spot where it is cut, and factories employ it in

PLATE XVII



[Photo: Lawrence.]

A. GLENDALOCH

This is a broad U-shaped valley in the Wicklow Mountains. Note the smooth, rounded outlines of the hills.



[Photo: Lawrence.]

B. THE LAKES OF KILLARNEY

The Mountains of Kerry are of Old Red Sandstone. The district is noted for its beauty and solitude of its moorland.

[To face page 126.]

PLATE XVIII



[Photo: Lawrence.]

A. MOUNT ERRIGAL IN DONEGAL

A quartzite mountain overlooking a barren plateau which is covered by moor and peat-bog.



[Photo: Lawrence.]

B. THE UPPER END OF LOUGH ERNE IN FERMANAGH

This big lake is strewn with islets, and has flat, boggy shores, except at points where green spurs project into the water.

making straw, paper, and even alcohol. Plans have also been suggested for using it to feed gas-works which would produce electric power. The Free State Government is vigorously encouraging the increasing use of the national fuel, in order to carry out its policy of restricting the import of coal.

2. ECONOMIC PRODUCTION

Natural conditions make Ireland a pastoral country. Cereal cultivation is handicapped by the damp, uncertain climate, while late springs, frequent rain, variable weather, and a feeble sun render corn crops precarious and delay the ripening of the grain.

On the other hand, the very circumstances which are unfavourable to agricultural crops encourage the growth of grass. Even on the mountains there is more grass and less heather than in Britain. The milder and more equable climate enables cattle to be kept in the open. Giraldus Cambrensis, writing in the 12th century, said of Ireland : ‘The harvests are less fruitful than might be supposed from the appearance of the standing crops, but the grass in the pastures remains as green in winter as in summer, so that the countryfolk do not have to mow hay, nor do they build byres for their cattle.’ The Irish are pastoral by nature. They became agriculturalists through necessity, in order to produce corn ; but as soon as modern tendencies had penetrated into their economic system, they applied themselves mainly to pastoral activities.

Since the beginning of the 18th century Ireland has been busy replacing agriculture by pasture (see Figs. 36 and 37). This development, which has been almost uninterrupted, has speeded up since the beginning of the 19th century. Under the influence of falling prices of corn, competition of foreign grain, and rising prices of meat and dairy produce—widespread factors which have affected rural districts on the Continent as well as in Ireland—the marks of the plough are throughout the island disappearing under a carpet of grass. The hedges are vanishing from the smaller farms, villages are falling to ruin, and cattle are replacing man. Between 1850 and 1914 the area devoted to corn crops fell from 3,095,770 to 1,247,865 acres, whilst the acreage under pasture rose from 8,752,565 to 12,451,772. Owing to the two great wars, cereals regained some of the lost ground,¹ but stock-raising is still the chief occupation, and three-fifths of the island is under grass, this proportion being exceeded in Munster. The development of pasture has been accompanied by an enormous increase in the number of animals. In 1841 there were 225 head of cattle to every 1000 persons ; in

¹ In 1947 the area under corn crops in Eire alone had risen to 1,561,505 acres, while land under pasture and hay had fallen to 7,564,589 acres.

1901 there were 1051 head ; in 1936 the number rose to 1123 ; and in 1947 to 1154.

The Irish peasant depends for his livelihood on the beasts he rears. In County Kildare he breeds fine, well-built horses which are much sought after as hunters ; and in the western mountains he raises the famous Connemara ponies—swift, strong little beasts which form the tireless assistants of every country family. No farm is so small but it has several pigs ; and some forty factories, most of which are in Limerick, Cork, and Waterford, produce bacon and hams for the Irish and British markets. But more especially Ireland is a huge storehouse of horned cattle for the English and Scottish slaughter-houses. The animals are bred in the infertile, hilly districts of the west, north, and south ; and they remain there until they are a year old. They are then sold to graziers on the Central Plain (see Plate XXIIA), where they spend the second phase of their existence in the open and on good pasture. They now become store cattle, that is, animals ready for fattening. At the end of their second or third year they start for their final destination, namely the fattener. This last stage is spent partly on the excellent pastures in Counties Dublin, Meath, and Kildare ; but especially on the intensive fattening pastures in England and Scotland. Every year hundreds of thousands of horned cattle are shipped to Glasgow and Liverpool. Out of every five cattle slaughtered for butcher's meat in Britain, two have been reared in Ireland.

Ireland has long been famous for its dairy produce, and Irish butter has gained a strong hold on British markets. The practice of co-operation, which is very necessary in a country of small farms in order to standardise production and organise sales, has spread all over the land. Since the foundation of the first co-operative dairy in Limerick in 1890, the movement has extended to all the rural districts, especially those in Counties Limerick and Tipperary. Throughout the country, lines of small, low-built donkey-carts may be seen every day carrying to the dairy big metal cans full of milk.

The Irish Co-operative Agency Society organises the sale of its members' produce in English and Scottish towns ; and by her contributions of live-stock and butter, Ireland must be reckoned among the countries which feed industrial Britain. Her pastoral production has never ceased to rise, her total number of cattle increasing from 1,863,000 in 1841 to 4,883,000 in 1947.

The area no longer used for cereals has been given up to grass and fodder crops (see Figs. 36 and 37). Whilst pasture land increased by 66 per cent. between 1859 and 1900 and root crops by 243 per

cent., the wheat crop fell by 90 per cent., barley by 60 per cent., and flax by 43 per cent. The value of the barley, flax, and wheat harvests together is less than that of the turnip and beet crops alone. It was only fear of a food shortage during the war years, 1914-18, that led the peasants to bring certain areas temporarily under the plough. A further increase took place in 1939-45.

Oats and potatoes are grown throughout the island, though they clearly show the limitations set on cultivation by the climate.

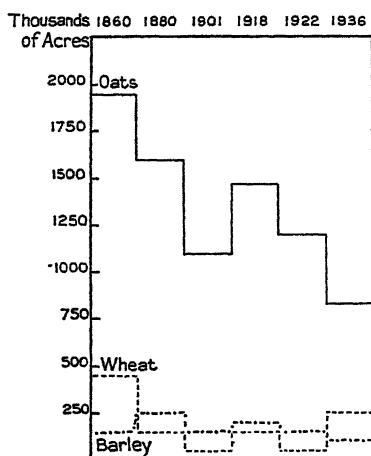


FIG. 36.

Tendencies in Agriculture in Ireland. The area under permanent grass has enormously increased, while the acreage of cereal crops has diminished.

Oats form the chief cereal and occupied 1,082,000 acres in 1910 ; 1,625,000 acres in 1918 ; 1,227,500 acres in 1922 ; and 830,000 acres in 1937. The crop is grown on every farm, the grain being used to feed the horses which are almost exclusively used in Irish agriculture. The potato forms the basis of human food and redeems Ireland from being a purely pastoral country. Owing to its influence, the once pastoral Irishman became a sedentary farmer. As the crop covers relatively large areas, it yields returns which are far smaller than those obtained in

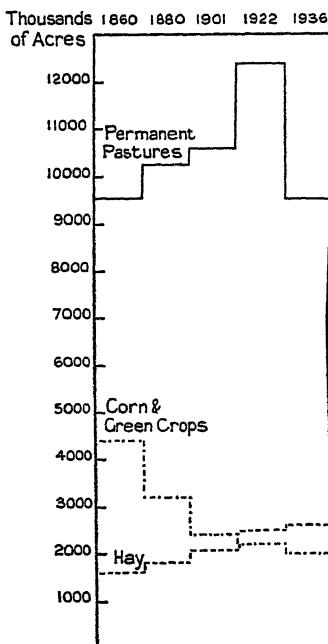


FIG. 37.

England or Scotland.¹ Moreover, the returns fluctuate greatly, owing to the climate; though in fact the terrible famine of 1846 was due to a potato disease. However, as famine is no longer feared, the potato is increasingly used for alcohol production.

The other agricultural products of Ireland are localised in the districts that suit them best. Wheat occupies but little space,² and is grown only in the eastern districts, particularly in Counties Down, Dublin, Tipperary, and Kilkenny, where the soil is more fertile and the summers warm and dry. In 1922, the wheat harvest was only one-thirty-seventh of that of Britain, and consequently Ireland was forced to depend to a greater extent even than Britain on foreign supplies. Large cargoes of American flour were landed at Cork, Belfast, and Dublin, and the grain mills in those ports ground none but imported wheat. But the energetic measures taken by the Free State Government to encourage the cultivation of wheat and to reduce the quantity imported have had immediate results. The area under the crop in the Free State rose from 20,800 acres in 1931 to 254,500 acres in 1936. In the latter year the quantity of wheat produced at home was more than half as great as the quantity imported. The tendency to increase has not spread to the industrial area of Northern Ireland, where the acreage devoted to the crop is insignificant.

Barley is cultivated in eight counties only, and is restricted more especially to the fertile soils of Wexford, the Cloyne district of Cork, and the North of Tipperary, where the yields are greater than those of Britain. But outside these districts the crop covers 132,500 acres, chiefly in the dry, sunny eastern parts of the island. In Leinster it covers 22 per cent. of the area devoted to cereals, as against 14 per cent. in Munster, 1 per cent. in Ulster, and 4 per cent. in Connaught. Barley cultivation owes its vigorous condition to the great breweries in Dublin, Cork, Kilkenny, and Dundalk, which consume more than half the harvest. Breweries and large distilleries help to make Dublin an industrial town in spite of the general agricultural nature of the country.

The cultivation of flax is even more localised, being concentrated in Ulster, and especially in the counties of Londonderry, Antrim, Down, Armagh, and Tyrone. It occupied 130,000 acres in 1860; 35,000 acres in 1913; 145,000 acres in 1918; 34,000 acres in 1922; and 23,250 acres in 1937; but owing to war conditions the acreage fell to 17,500 in 1947. The plant, which was formerly introduced

¹ The area devoted to the crop in 1900 was 660,000 acres, in 1918 it was 710,000 acres, in 1922 it was 575,000 acres, and in 1937 it was 500,000 acres.

² 34,250 acres in 1913, 162,000 acres in 1918, 41,250 acres in 1922, but 225,000 in 1937.

PLATE XIX



[Photo: A. Demangeon.]

A. LIMESTONE SCENERY AT CORROFIN NEAR ENNIS IN COUNTY CLARE



[Photo: A. Demangeon.]

B. THE SHANNON VALLEY TO THE SOUTH OF KILLALOE

As the river flows over hard rock at this point, the valley has narrowed, and there are no lakes or marshes. The hill in the background is Tountina Mountain, which rises to a height of about 1600 feet.

[To face page 130.]

PLATE XX



[Photo: Lawrence.]

A. A COTTAGE IN DONEGAL
Note the pile of peat near the doorway.



[Photo: Lawrence.]

B. PEAT-CUTTING AT BALLYMENA IN THE WEST OF IRELAND

by Scottish settlers, requires intensive cultivation and is unlikely to survive agricultural crises, except in the neighbourhood of the textile industries in Belfast.

In the last few years the cultivation of sugar-beet has been developed. In 1937, owing to official action, it covered some 60,000 acres, half of which lay in the Free State, and particularly in Counties Carlow, Leix, Wexford, Cork, Tipperary, and Galway. The new sugar industry was founded at the same time, the first factory having opened at Carlow in 1936. Sugar production reached 173,700 tons in 1936, whilst the imports were reduced to 54,236 tons.

All these products of the soil form the real wealth of Ireland. Though next door to the great industrial and commercial region of Britain, she preserves all the characteristics of a pastoral and agricultural country ; and the Irishman is above all a peasant, a son of the soil.

3. RURAL LIFE

As far back as the history of Ireland can be traced, the country appears to have been one of small cultivators. Before the British colonisation this fact survived all the changes in the system of land tenure, and it explains the attachment of the Irish peasant to the soil that feeds him.

THE AGRARIAN SYSTEM. Owing to the extraordinary increase in the population, the subdivision of Irish farms seems to have reached its maximum on the first half of the 19th century. The vast number of peasants who shared in and competed for the land had reduced the holdings to an almost infinitesimal size. In 1843, less than half exceeded an area of $7\frac{1}{2}$ acres, and there were dwarf holdings too small to feed a family. These wretched conditions, which were very common in the infertile districts of Connaught, Kerry, and Donegal, resulted in a veritable 'congestion' of the country. As a remedy, the Government instituted in 1891 the Congested Districts Board, whose activities extended over one-sixth of Ireland and affected one-ninth of the population. This Board aimed at a systematic increase in the size of the holdings and achieved real successes, among which was the complete redistribution of land in the 'isle' of Clare. But owing to the great increase of grazing (which needed larger holdings), and especially of emigration (which withdrew many of the competitors in the struggle for land), the end of the 19th century was marked by a check and even a reversal of the process of subdivision.

The new tendency towards larger holdings has not changed the traditional character of the agricultural community, which still

consists of small cultivators. Between 1931 and 1934 the situation was as follows :—

Agricultural Holdings in Ireland

<i>Holdings Group.</i>	<i>Percentage of the Total Number.</i>		<i>Percentage of the Land Cultivated.</i>	
	<i>Free State, 1946.</i>	<i>Northern Ireland, 1934.</i>	<i>Free State, 1931.</i>	<i>Northern Ireland, 1934.</i>
1 to 5 acres .	22.8	10.9	0.6 ¹	1.4
5 „ 30 „ .	40.0	55.7	18.7	32.7
30 „ 50 „ .	29.6	17.1	16.3	22.8
50 „ 100 „ .	13.2	12.2	23.5	26.6
100 „ 200 „ .	5.6	3.1	19.5	11.1
Above 200 acres .	2.1	1.0	21.2	5.4

The table shows that two-thirds of the holdings in Ireland do not exceed 30 acres, an area required to keep the farmer and his family in comfort. Hence, some economists regret the encroachment of pasture land on the arable and regard the future welfare of the peasant as dependent on the allotment of the grasslands to the farmers and a return to the plough. The new economic policy of the Free State has encouraged a change in this direction. However, the work of co-operative societies, which permits the collective purchase of manure and the joint sale of produce, has greatly increased the peasants' capacity for resistance.

SYSTEMS OF TENURE. Though Ireland is a land of small cultivators, it is nevertheless a country of great estates. A very large number of peasants till fields which they do not own, and more than three-fifths of the soil is in the hands of 15,000 landlords. The great estates are of two kinds : those consisting of small holdings which are let out to peasants, and those forming large grazing lands which are worked by the owners or their stewards. The latter type plays an important part in the pastoral system as a whole. Owing to their huge area and the ample capital of their owners, the large grazing properties form an essential link between the small farmer who sells his beasts at an early age and the market which buys them partly or wholly fattened. Whilst the small farms have 63 per cent. of their area under grass and 37 under cultivation, the large estates place 80 per cent. of their area under grass.

In contrast with the landlords are the peasants, who cultivate the soil and are deeply attached to it. Their whole past and their

¹ The cultivated area for holdings of less than one acre has been omitted.

whole life is summed up in their efforts to maintain contact with the soil. The history of Irish farming would fill a library by itself. When stripped of its passions, its hatreds, and the poverty with which it is saturated, it is the record of a nation of small cultivators fixed to the soil by very ancient custom, but faced with the disturbance of these conditions and with threats to its existence owing to the arrival of English and Scottish settlers. In our own times the small cultivators have, after age-long struggles, won security of tenure and struck their roots into the soil more and more deeply. English colonisation had substituted the system of tenancy at will for the old Celtic customs which gave security of tenure to all tenants on the land. The peasant no longer had a right to his land, the whole right of property having passed to the English owner, who could evict him at will. In the early days of stock-raising, thousands of peasants were evicted from their farms, reduced to poverty, and forced to emigrate. In the end English commonsense realised that these people who lived by the soil should have a right to their holdings. By a series of laws which came into operation after 1881 the Irish peasantry obtained, first, a reduction of rent (which had soared up to exorbitant figures); later, they secured a legally fixed tariff; and, finally, in certain prescribed circumstances they acquired security of tenure, that is, the certainty of not being evicted from their holdings, a feeling of security in the future, and the stability of their homes.

But another change, which was also important and far-reaching, slowly took place among the peasantry. Thanks to the agrarian laws passed between 1869 and 1903, many Irish tenants became the legal owners of their land. In this way peasant proprietorship began. A practical system of advances made to the peasants from public funds and repayable by annual instalments enabled them to acquire their farms; and they did not fail to grasp the opportunity. Between 1885 and 1909 nearly 145,000 tenants became owners of their land. In 1918 65 per cent. of the Irish farmers owned their farms either wholly or in part. This should be contrasted with the situation in Britain, where the percentage is ten. Thus, the numbers of farmers working their own land was six times greater in Ireland than in England. The purchase of holdings was made practically compulsory by law in the Free State in 1923 and in Northern Ireland in 1925. Between 1870 and 1936 the area thus purchased amounted in the present Free State to 14,877,000 acres, or 88 per cent. of that part of the island; and in Northern Ireland to 2,715,700 acres, or 81 per cent. of that section. At the same time the Free State vigorously redistributed the holdings in the congested districts. Soon the whole of Ireland will have been

purchased from the landlords, and a general system of small freehold properties is now nearly an accomplished fact. Rural Ireland is moving towards a social condition different from that of Britain, but like that of France, a condition in which the peasantry, by owning the land, becomes as it were a part of it.

Whether tenant or landowner, the Irish peasant leads a simple, unpretentious life, the standard of which is steadily improving. But there still remain, especially in the west, a number of very humble and even primitive farms comprising strips of spade-cultivated land in which rock often appears at the surface and of pastures that are too poor to feed the single cow. The pigs run loose and are fed on fish offals. Farming is eking out with minor occupations, such as fishing in the bays or collecting seaweed. Wool from the flock is spun and woven on the family spindle and weaving-frame. The dwelling is a rude shelter built of dry wall roofed with thatch or reeds. Sometimes it consists of a single room and has no chimney; but as a rule there are two rooms, a bedroom and a kitchen, a corner of the latter being occupied by the cow and pigs. These conditions are slowly improving, but they still persist in out-of-the-way districts, in remote islands, and in the western mountains; and they are not unlike those existing in other remote extremities of Europe.

THE RURAL POPULATION. Owing to the multiplication of small holdings which took place at the end of the 18th century and the beginning of the 19th, the density of population increased to the very limit of the resources of the soil. The number of inhabitants rose from 1,000,000 in 1672 to 4,040,000 in 1788, to 6,801,820 in 1821, and to 8,500,000 in 1846, when it formed one-third of the population of the United Kingdom. The last figure gives a density of more than 260 persons to the square mile, which is an astounding record for a country whose best land is under grass. The balance between the size of the population and the volume of food production was precarious, which led to chronic instability among the poverty-stricken peasantry. As the number of families grew, so the size of each family holding lessened. About 1845 it was reckoned that 585,000 farm workers were unemployed for thirty weeks in the year. This state of things ended in one of the most intense waves of migration that the world has ever known. During the first quarter of the 19th century the Irish had already been migrating at a rate of 20,000 or 30,000 a year, and between 1831 and 1841 the number of departures was registered as 214,000. But when the great famine took place, the exodus became wholesale. Between 1846 and 1861, the number of emigrants amounted to 3,390,000. In 1851 alone there were 254,300, that is, nearly thirty-five per thousand

of the population. In the fifty years between 1850 and 1900 the country lost through emigration about four million of its inhabitants. The movement slackened in the 20th century to about 30,000 a year, and in 1920 the number fell to 15,600. The closing of the United States by the strict quota laws almost shut off the stream of emigration. A few hundred emigrants still leave every year for the Dominions and the United States ; but since 1931 their number has been regularly less than that of the returning emigrants.

Emigration has affected the western counties most, since these are the poorest. Between 1841 and 1901 Ulster lost 33 per cent. of its population, Leinster 41 per cent., Munster 55 per cent., and Connaught 57 per cent. Six per cent. of the emigrants settled in Glasgow, Manchester, and Liverpool, where their descendants now occupy whole quarters of these towns. Ninety per cent. went to the United States, where the Irish population is now four times as numerous as that of Ireland. It has been said that Ireland is no longer on the banks of the Shannon, but on those of the Hudson. The large and vigorous Irish-American colony is still strongly attached to the old country and always ready to help her. The Irish in the United States have never forgotten or abandoned their European cousins, and they have done their utmost to bring about the national independence of Ireland.

In contrast with the other countries of Europe which by natural increase quickly filled the gaps left by emigration, Ireland has been depopulated. In the little islands on the west coast and in the rocky and boggy districts on the mainland the parishes have within fifty years lost a quarter, a third, or even half their inhabitants. The emigration of adults lowered the number of marriages throughout the country, and the birth-rate fell. Pauperism maintained the high death-rate, and the annual excess of births is only six per thousand. The population of the island decreased from 8,500,000 in 1846 to 4,458,000 in 1911, to 4,496,000 in 1921, and 4,229,000 in 1943. Whilst in 1846 Ireland contained one-third of the population of the British Isles, to-day it holds barely a twelfth.

4. TOWN LIFE

IN this island of peasants the mainspring of town life has always been the sea, across which foreign influence has found its way. All the large Irish towns are ports, and six of them—Dublin, Belfast, Cork, Limerick, Londonderry, and Waterford—together contain one-fifth of the total population. They have always been the naval bases of conquerors, markets for native products, and centres of foreign influence. In our own time, by receiving imports

of coal and raw material, they have become foci of industry. Whilst in 1800 the urban population of Ireland was one-fifth of the whole population, in 1921 it formed one-third, and in 1936 one-half.

The inland towns are rural centres whose populations seldom exceed 10,000. They act as local market towns to which the country-folk take their produce and in which they make their purchases, though some owe their existence to their character as ecclesiastical and administrative centres. They are nearly all placed on the strips of lowland which occur in all parts of Ireland. There is no grouping. Towns like Carlow (pop. 7600) in the Barrow valley, Kilkenny (pop. 10,200) on the Nore, Thurles (pop. 5600), Clonmel (pop. 9400), Carrick, Tipperary (pop. 9400), Enniskillen (pop. 5000), Omagh, and Monaghan, are scattered according to local requirements. Athlone (pop. 7200) on the Shannon lies on the main route from Dublin to Galway.

The usual position of the larger towns in Ireland is at the heads of the bays and estuaries. But such a site is of little human value on the wild coast which faces the Atlantic. The only big town in the west is Limerick (pop. 41,400), which is situated close to a fertile area and on the estuary of the Shannon near the lowest bridge on the stream, where the tide ranges 12 to 18 feet. It depends for its existence as a town and as a port on its relation to an agricultural backland, and it is a centre for the preparation of agricultural produce for the market. Hence, it contains bacon factories, flour-mills, and dairies for the production of butter and condensed milk. It exports these articles and imports cereals, sugar, petrol, and coal for distribution to the interior of the country. At Ardnacrusha, to the north of Limerick, a hydro-electric plant was constructed in 1930 to utilise the steep gradient in the Shannon at Killaloe in order to supply power to the chief towns in the Free State. A new port has recently been established at Foynes on the south bank of the Shannon estuary. Its imports are mainly petrol, cement, and coal; hence, it has to some extent robbed Limerick of its functions.

Galway (pop. 18,000) lies in a bight sheltered by the Aran Islands and at the mouth of the river draining Lough Corrib. This stream, whose fast-flowing current is used for turning flour-mills, is five miles long. The town, which stands on a triangular area between the river and the sea, formerly guarded the gate to Connemara and from the 13th century onwards was held by an English garrison. At the head of the long bight which separates Mayo and Donegal stands Sligo, which, like Galway, is situated on a short tidal river between a lake and the sea. Regular steamship services take its agricultural produce to Glasgow and Liverpool. Tralee (pop. 10,300), which stands on a rapidly silting inlet to the south of the Shannon estuary,

PLATE XXI



[Photo: Lawrence.

WATERFORD AND THE SUIR ESTUARY

The town is situated at the lowest bridge over the river.

PLATE XXII



[Photo: A. Demangeon.

A. THE MARKET PLACE IN KILKEE, COUNTY CLARE



[Photo: Lawrence

B. TRINITY COLLEGE, DUBLIN
The College dates from the 18th century.

retains its shipping trade through its outport at Blennerville. Bantry, which is situated at the head of the bay of the same name and was formerly a port for sardine fishing, is now merely a tourist centre.

The whole of the west coast of Ireland faces America and is the nearest portion of Europe to that continent, Galway being 1656 miles from St. John's, Newfoundland. But so far it has derived no advantage from this position and has developed no trade across the Atlantic. The little island of Valentia (see Plate IXB), with an area of ten square miles and situated off the end of one of the peninsulas of Kerry, is the only place on this coast which is in touch with the world in general. In 1866, it was from Valentia Island to Trinity Bay, Newfoundland, that the first trans-Atlantic telegraph cable was laid. The landing of three other cables on the little rocky island makes it one of the greatest telegraph stations in the world. In 1937 the west coast of Ireland was connected with Newfoundland, when Foynes became the European base of the first trans-Atlantic air mail between England and U.S.A. The greater range of aircraft now makes this stop unnecessary, but American air lines touch at Shannon airport, the successor to Foynes, and B.O.A.C. aircraft bound from Prestwick to New York call at the port.

Ireland's external relations are mainly with Great Britain, and her large towns are all on the east coast. Town life is concentrated in three groups of ports : Cork, Waterford, and Wexford in the south ; Dublin, Drogheda, and Dundalk in the centre ; and Belfast and Londonderry in the north. Of these Belfast, Dublin, and Cork are representative of the three different economic systems in Ireland. Belfast, lying opposite Scotland, is itself a Scottish town both by the origin of its inhabitants and the character of its industry ; Dublin, which faces England, is an Anglo-Saxon capital city and the headquarters of English culture ; Cork is thoroughly Irish.

All the towns mentioned above are placed on tidal estuaries. Wexford (pop. 12,200) is sheltered seawards by a sand-spit and provides a haven for the ships which bring coal and take cereals. But the shallowness of the harbour restricts the trade to coast-wise traffic. An outpost for fast boats to England has been built at Rosslare, through which goes a passenger and mail service to London *via* Fishguard. At Waterford (pop. 27,900), at the head of the Suir estuary, the tide carries vessels nearly 19 miles inland. The town is a market for agricultural produce and exports to England hams and bacon cured in its factories and herds of cattle from the surrounding country (see Plate XXI).

What is known as Cork Harbour is a series of bays and narrow channels running from the sea to the town over a distance of about 20 miles. Near its mouth the depth varies from eight to fifteen

fathoms, and between Queenstown (Cobh) and Cork it is about six fathoms. The seaport is divided between Cork (pop. 80,700), the main town which is in direct contact with the agricultural backland, and Queenstown (pop. 6000), the outport which is a port of call and of transhipment. The town of Cork is built on an island in the River Lee. The surrounding country is swampy and is cut by tidal channels. In fact, the original of the name Cork (*i.e.* Carcach) means 'swamp.' The town fills the whole island and overflows on to both banks of the river. On the north bank the houses are built in tiers, under which the railway passes by a tunnel. Situated at the lowest point at which the river can be bridged, it is reached by ships at high tide. Life in Cork reflects economic conditions in southeastern Ireland, which is the most highly developed pastoral and dairying region in the country. Coal is imported from Wales, and agricultural produce is exported to Bristol and Wales. The town has a butter exchange and a dairy school. Its distilleries, breweries, tanneries, flour-mills, and chemical and preserved meat factories work up commodities produced by the peasantry, handle the commodities brought to them by the peasants, or manufacture those needed for agriculture. The old wool industry survives in the weaving of tweeds, and quite recently there have been established a farm-tractor factory, a shipbuilding yard, and a Ford motor-car factory. Cork is the commercial centre. Downstream are a number of islands scattered in the estuary. On one of these is Queenstown, which was formerly a port of call for trans-Atlantic lines sailing to and from New York or Boston. Time could be saved by travelling overland to or from England, the crossing between Rosslare and Fishguard being done in a fast cross-channel steamer. The natural strength of the harbour caused the Admiralty to choose it as a naval station.

Belfast has grown up at the head of a long funnel-shaped lough which opens towards the coast of Scotland. A typical modern industrial creation, it is unique among Irish towns. Its wealth originally lay in the manufacture of linen, an industry which here, as in Flanders, arose out of the cultivation of flax. In the 18th century this exacting and difficult plant was cultivated throughout Ireland, but it is now grown in Ulster only, where it is near the factories. Its producers are industrious peasants who own their farms. As between 1860 and 1922 the production of linen had decreased to a quarter of its former volume, in spite of an ever-increasing demand, the industry in Belfast was forced to import coarser grades from Russia and finer grades from Belgium. At the end of the 18th century linen manufacture was still spread over many of the counties of Ireland. The reason why it has now been concen-

trated in Ulster is that this province contained a wealthier and more settled class of rural tenants than existed elsewhere in Ireland and that these farmers were ready to sink their savings in the purchase of looms, since they wished to increase their income by combining farming with industry. By the beginning of the 19th century Ulster was already the most busy centre of linen manufacture. The threads were spun and woven in the villages, and merchants rode round the countryside from market to market, buying the cloth and exporting it from Belfast. When the Industrial Revolution took place, manufacture deserted the country districts, and all the activities became centred round the factories. The movement began in the spinning trade, for spindles from Leeds and Dundee reached Ulster in 1828. By 1853 the number of spindles had risen to 500,000, whilst in 1935 they had increased still further to 800,000. Ulster began to supply hempspun to France, Belgium, and Germany, a trade which still goes on, especially in the finer qualities of the produce. Machine-weaving was developed particularly after 1850, in which year the number of looms was eighty. By 1866 this had increased to 10,800, and in 1921 to 40,000, but in 1935 it had fallen to 28,000. Between 1880 and 1910 a large export trade sprang up with a mean annual value of £5,000,000 to £6,000,000. In 1934 this had risen to £13,000,000. Ulster has great advantages in the process of bleaching owing to the presence of large fields of grass on which the cloth can be spread out to bleach, to the excellence of the local water, and to the equable climate which makes work possible all the year round. The linen industry is the true national occupation of Ulster and in 1930 employed 60,000 persons. Belfast is its centre and business headquarters and contains its largest factories. But the industry has caused a whole swarm of towns to spring up around Belfast, viz. Portadown, Lurgan, Lisburn, Bangor, Newtownards, Cookstown, Ballymena, Coleraine, and Limavady.

Another great industry—that of shipbuilding—has contributed to the growth of Belfast. The town has neither iron nor coal, but imports these requisites from Scotland. Since heavy metallurgical trades were impossible, recourse was had rather to those industries requiring much labour. There is a close connexion between the labour supply in the two great industries of Belfast, for, whilst the women and children work in the textile factories, the men are employed in the shipyards. Thus, the two industries maintain each other's supply of labour. Scottish shipbuilders began to build ships on the banks of the Lagan in 1791, and the first iron vessel was launched in 1844. The great firm of Harland and Wolff was founded in 1862 and from that date constructed the big White Star

liners. Another firm, Workman, Clark & Co., dates from 1879. These two firms alone employed 30,000 workmen. With an annual productive capacity of 250,000 tons, they launched 197,800 tons in 1919, and 116,500 tons in 1920. But the general economic depression in the '30's affected the industry. Workman, Clark & Co. closed down in 1935. Harland and Wolff, which therefore survives alone, is capable of employing 20,000 workmen and of constructing nineteen ships simultaneously in its yards on Queen's Island. Naval rearmament has for some years placed warships on the stocks at Belfast, and in 1937 a tonnage of 74,274 was launched from its yards. In January, 1938, vessels under construction amounted to 133,000 tons.

The shipyards of Belfast are one of the most peculiar forms of industry in the British Isles and are in contrast with the yards on the Clyde. Its association of industries cannot survive without cheap transport, and the town therefore needs great docks. Its harbour, which is on the Lagan, is a work of modern engineering. Up to the middle of the 19th century large ships could not reach the quays, but had to anchor in the lough and discharge their cargoes on to lighters. But now the fairway has been straightened and deepened, and in 1882 the Victoria channel was made with a length of 4½ miles into the harbour. If coastwise traffic is included in the reckoning, Belfast is one of the greatest ports in the United Kingdom, trading largely with Glasgow and Liverpool, to which it exports textiles, cattle, ships, and farm produce, receiving in exchange coal, steel, flour, cereals, sugar, hemp, linen, and wood. The needs of the port and of the swarm of work-people have caused the growth of other industries, the most important of which are iron foundries, tobacco factories, distilleries, flour mills, tanneries, saw mills, and factories for producing chemicals, rope, boots and shoes, matches, and agricultural implements. Around these factories the town has grown rapidly since the industrial revolution. At the beginning of the 19th century it had only 15,000 inhabitants, but reached 120,800 in 1861 and 438,000 in 1937. Its growth has overwhelmed the neighbouring ports of Carrickfergus, Holywood, Bangor, and Donaghadee, which are now mere seaside resorts. Its modern appearance, its tall American-like buildings, and its smoke-blackened brick houses make it more like Glasgow and Liverpool than an Irish town.

The only towns which have escaped the overshadowing influence of Belfast are those which are far enough away to keep their independence. Larne (pop. 11,090) is a ferryport connected with Stranraer, and Coleraine (pop. 9000) produces tinned meat, alcoholic spirits, and textiles. The largest and most vigorous is Londonderry

(pop. 48,000), which is situated at the inner end of Lough Foyle. In the 18th century and at the beginning of the 19th it was the market for cloth woven in the neighbouring villages. About 1850 it began to specialise in the making of shirts. Whilst the cutting out, bleaching, and finishing are done in factories, the needlework is still partly carried out by the domestic method. Some 40,000 women in the country districts of Counties Londonderry, Donegal, and Tyrone take in piece work from Londonderry town. It is one of the rare instances in Great Britain of the survival of the old domestic industries. Londonderry, with its improved harbour, is connected by regular services with Glasgow, Liverpool, and Belfast. Its shipyards construct the hulls of ships, which are then taken to Glasgow to be finished. Some of the trans-Atlantic liners running from Glasgow to New York and Canada call at its out-port. But its activity is mainly local. It exports textiles, linen goods, oats, potatoes, and the produce of distilleries, breweries, and tanneries.

On the east coast of the Central Plain are three estuaries which give easy access to the fertile districts of the Irish midlands. On one of these Dundalk (pop. 14,700) grew up as early as the 12th century around an English fortress at a point where the River Fane enters a much silted bog. It now exists as a little port which ships local agricultural produce to Glasgow and Liverpool, though it has a few industrial works, including distilleries, breweries, flour mills, linen and tobacco factories, and the workshops of the Great Northern Railway. Further south in the estuary of the Boyne lies Drogheda (pop. 14,500), the ancient Droichead Atha or 'ford by the bridge.' Formerly a Danish settlement, then an Anglo-Norman castle, to-day it is, like Dundalk, a little centre of commerce and industry. On the third estuary, that of the Liffey, is Dublin, the Anglo-Saxon capital of Ireland.

The city was founded at a point where the Central Plain opens unobstructed on to the sea. On the one hand, it faces Holyhead and the seaward end of the Plain of Chester; on the other, it guards the natural gateway into the country and stands at the focus of routes to the west. At the end of the 18th century, when the Irish canal system was planned, Dublin became the starting-point of two waterways which joined the east coast to the Shannon, viz. the Grand Canal, which reaches the river at Ballinasloe, and the Royal Canal, which enters it above Lough Ree. In 1810, the Grand Canal was the usual route for travellers and goods going from east to west. Nowadays, most of the roads and railways which cross the island converge on Dublin.

In truth, Dublin is not an Irish town by origin, but owed its growth

to the invader. The Norse wickings made it a base for operations in the interior, and, until the arrival of the Anglo-Saxons, it was for the Irish the town of the 'Eastmen,' a hostile camp, and a sword in the side of the country. Many of the names of places in its neighbourhood, like Dalkey, Lambay, Howth, and Oxmanstown, are of Scandinavian provenance. Then Dublin became the citadel of the English, a foreign colony inhabited by settlers from Bristol and placed under the patronage of St. Werburgh, whose name is still borne by a parish church. During the course of its history, it has always kept its character as a foreign stronghold, an English colony planted on Irish ground. From the settlement of the English in the 13th century until about the middle of the 17th it kept the appearance of a fortress, with its houses clustering round the Castle and Christchurch Cathedral, and with its narrow, winding streets. From the middle of the 17th century until the beginning of the 18th English colonisation took root successfully throughout the country; hence, the fortress lost its usefulness, and the town became a kind of colonial capital and the residence of all that represented the mother country. It overflowed the old ramparts and spread out north and south of the river. Two immense parks, St. Stephen's Green in the south and Phoenix Park in the north, were made at this period and now form open spaces similar to those which adorn many English towns (see Plate XXIIb).

From the 18th century onwards another form of life penetrated the city, and Dublin became a commercial town, spreading eastwards along the Liffey and expanding as its docks grew. The chief buildings of the town—the Bank of Ireland, Parliament House, the front of Trinity College, the National Gallery, the Museum, and the Library—all date from this period of prosperity, and with their 18th-century architecture give an appearance of sober elegance to the quarters which they adorn.

At the beginning of the 19th century Dublin was already a large town. It had 186,000 inhabitants in 1822, when Belfast had only 39,000. It keeps its metropolitan character, increasing not by bounds, like Belfast, which trebled its population between 1821 and 1851, but steadily with the momentum given it by its political functions and its large population. By 1841 it had 233,000 inhabitants, by 1901 it had 289,000; by 1911 it had 305,000; and by 1936 it had 468,000. In recent years a new feature has been added to the material life of Dublin, for the town has been overflowing into its suburbs and has formed a great conurbation. Greater Dublin stretches northeastwards to Clontarf, Drumcondra, Glasnevin, and Kilmainham; and southeastwards to Rathmines, Pembroke, Blackrock, Kingstown, and Killiney. Kingstown (Dun Laoghaire,

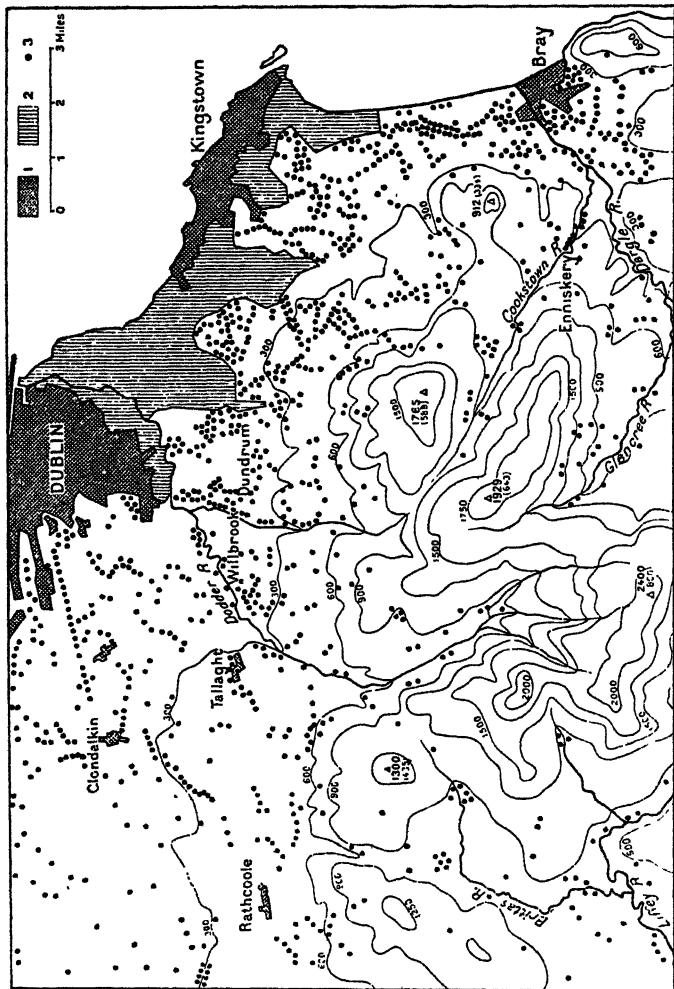


FIG. 38. Human Settlement at the line of Contact between Mountain and Plain to the South of Dublin.

1. Towns. 2. Urban districts. 3. Isolated houses or small groups of dwellings.
The influence of relief on settlement is clearly shown, as is also the contrast between upland and lowland. Settlement becomes dense on the plains and in the lower portions of the valleys, whilst it is sparse or absent on the uplands. In rural areas the dwellings are scattered. The elevation reached by settlement is astonishingly low, never rising above the 1000-foot contour in the west or the 1500-foot contour in the east.

pop. 40,000) has become an outport of Dublin and a ferryport connected with Holyhead by fast steamers. Furthermore, the first Irish railway ran from Dublin to Kingstown and was opened in 1834. Other places which must now be reckoned among the suburbs of Dublin are the seaside resorts of Howth, Malahide, Skerries, Balbriggan, and Bray, together with those charming villages of Foxrock, Stillorgan, and Dundrum which nestle under the Wicklow hills (see Fig. 38).

Dublin is not a modern creation of coal and machinery like Belfast, nor is it so intensely industrial. Its industry, which is served by an artificial harbour, depends on preparing for the market the produce of the Irish soil and on the proximity of the British market. Its best-known industries are distilling and brewing. An enormous quantity of alcohol is produced. In 1917 480,000 gallons were exported in the form of drink and 11,000,000 gallons for industrial purposes. The huge breweries use a large proportion of the Irish barley crop and import hops from Kent and America. They produce mainly for the British and foreign markets, exporting on the average nearly 33 million gallons of Guinness. Before the economic depression of the '30's the two industries alone employed more than 8000 workers. Other forms of industry have sprung up around them, profiting from the advantages of a good harbour and a large town, viz. chemical manure factories which use American and African phosphates, biscuit factories which use imported flour; tobacco, soap, bottle, and boot and shoe factories, printing-presses, railway workshops—in short, all the various industries which are called into being in a large town in an agricultural country.

The dominant feature in the appearance of Dublin is its metropolitan character and its position as a colonial and commercial centre, which made it a large town before the growth of modern cities. If Belfast did not exist, Ireland might be compared, with its absence of large towns in its rural areas, with its large capital, and with its agricultural port at Cork, to rural England in the Middle Ages, with its urban centres at London and Bristol, or else to a dominion like Australia.

5. TRADE RELATIONS

For centuries the whole economic system of Ireland has been subordinate to that of Great Britain. Since the latter is nearer to the Continent and has a wider commerce, Ireland has always been behind her in material progress and has always been influenced by her greater wealth, resources, and culture. To the mighty headquarters of Empire she has always been a colonial possession, an

agent in great commercial enterprises, and an auxiliary in industrial development. Ireland realises the advantages of this economic dependence, since she has at her gates the enormous markets of Britain in which to sell her produce. But she has also suffered, since her enterprises, such as her woollen manufactures, which might have rivalled those of the larger country, have been strangled.

The coal mines of Ireland contain about 175 million tons of coal. But as they are difficult to work and the coal is of an inferior quality, mining will be unprofitable so long as cheap coal is brought to her ports from Britain. The northern counties depend on the Scottish coalfields for their supply, whilst the central and southern areas draw theirs from Cumberland and Lancashire. Until very recently the value of the coal imported from Great Britain formed more than one-quarter of the total import of raw materials. The consumption of coal is four tons per head of the population in Great Britain, but in Ireland it is only half a hundredweight. Metals extracted in Ireland are taken to Britain to be worked up, the iron ore from Antrim being taken to the foundries of Ayrshire and Wales, and the aluminium ore to the factories at Kinlochleven and Foyers on the banks of the Caledonian Canal, whilst the small quantity of copper pyrites obtained in Ireland is shipped to Swansea and Lancashire.

Commerce in agricultural produce, which is the true wealth of Ireland, is wholly regulated by the British market, whose fluctuations are reflected by variations in production. An increase in stock-raising in Britain causes Irish stock-farming to suffer. Sometimes, as in 1666 and 1678, her cattle cannot be sold ; at other times, as at the beginning of the 18th century, she cannot find an export market for her wool. 'It must be thought,' said a pamphlet of 1731, 'that Irishmen are animals of quite a different species from other men and that their stomachs can digest wool.' When Britain became industrialised at the end of the 18th and beginning of the 19th century, when her population increased and she needed cereals, Ireland extended her area under corn crops ; in the middle of the 19th century, when Britain opened her ports to foreign wheat,

Export of Live Cattle from Ireland to Britain

	Cattle.	Sheep.	Pigs.
1854-56 . . .	242,280	482,830	241,293
1894-96 . . .	766,707	782,323	580,925
1901-05 . . .	804,000	833,000	535,000
1907-09 . . .	847,023	750,986	398,837
1917-19 . . .	791,410	628,376	188,651
1927-29 } Free State only	{ 741,953	581,500	262,900
1934 }	{ 505,104	364,780	133,852

IRELAND

Ireland returned to pasturage and found an outlet for her pastoral products in the large towns and industrial centres in the larger



FIG. 39. Political Divisions and Chief Towns of Ireland. The hatched line marks the boundary between the Free State and Northern Ireland.

island. For more than three centuries the trade in live cattle between the two countries has been more vigorous and continuous than any other similar commercial movement in existence to-day. Every year hundreds of thousands of animals cross the sea to be fattened

and marketed in Britain. The table on p. 145 gives some idea of this enormous trade.

Other countries export a greater weight of meat to Britain than Ireland does ; but Ireland is Britain's chief purveyor of livestock. To the animals must be added the other farm products, viz. butter, cheese, condensed milk, poultry and eggs, potatoes, bacon, and ham. Since Ireland lives by farming and exports her farm produce to Britain, it may be said that she could not exist without Britain. She has been a satellite, conforming to the trade requirements of her greater neighbour and varying her imports and exports to the latter's needs. In 1909-13 77·1 per cent. of the total imports of Ireland came from Britain, in 1918 88·1 per cent., in 1920 78·3 per cent. In 1909-13 96·1 per cent. of the total exports of Ireland went to Britain, in 1917 99·9 per cent., in 1918 94·4 per cent., and in 1920 88·7 per cent. Altogether, for the years 1909 to 1920 Ireland did between 85·5 and 94·4 per cent. of her overseas trade with Britain. There are few instances of such close economic relation between countries.

The sea which encircles Ireland is not Irish, but British. From the beginning there was no room for both British and Irish shipping, and at the end of the 18th century Irish ships were forbidden to carry colonial produce from one colony to another. In 1728, England had monopolised two-thirds of the Irish shipping trade ; in 1778 the proportion had risen to seven-eighths, and by the middle of the 19th century she had taken the whole. Thenceforth Irish produce was shipped and exports received wholly in English vessels. To-day Ireland still communicates with the world almost entirely by means of British ships and, moreover, usually through British ports. Belfast, Dublin, Londonderry, and Cork certainly do import cargoes of wheat directly from America, but practically all Irish exports pass through Britain even on their way to foreign countries. Goods destined for America are despatched from Liverpool and Glasgow, not from Limerick, Galway, or even Dublin. Many Irish ports are still connected with Liverpool or Glasgow by regular steamship services, but not with each other ; and Ireland communicates with Ireland through Great Britain. Up to 1910 there was no direct passenger and mail service between Ireland and America, and Irish emigrants went through Liverpool. The world's commerce passes close to Ireland, but scarcely touches her shores.

This economic subordination has been somewhat loosened by the efforts of the Free State Government. Irish nationalists aim at assuming control of their own overseas trade ; since 1920 direct services have been running from Ireland to certain ports in France,

Spain, and Belgium, and there is now even a regular line to New York. Naturally, the most frequent services are to Britain. To mention fast lines only, the most important are those from Larne to Stranraer (36 miles) ; from Belfast to Heysham and Liverpool ; from Dublin and Kingstown to Holyhead (70 miles) ; and from Rosslare to Fishguard (62 miles).

Although the greater part of the territory of Ireland forms an independent state, the ties which bind the islands together will not be broken. No Irishman can seriously entertain the idea. Ireland earns her living by Great Britain, selling her cattle, butter, and Guinness in that country, and obtaining from it her capital, her coal, her cloth, her flour, her manure, and her machinery. Between the two islands there is a strong economic bond, and there can be no question of Ireland's living apart. What her political independence will bring is an opportunity of making the partnership fairer by giving Irishmen a greater share in exploiting their wealth and labour. The establishment of the Free State means more liberty and justice in the conduct of the moral and material interests of the Irish people, but it cannot destroy the basis of its economic life. Certain ties of vassalage which must lie in the relation between the two countries formerly placed Ireland in the position of a kind of colony of exploitation ; but the new status of dominion has abolished these fetters. There are, however, other bonds which derive their strength from natural circumstances, from the geographical proximity of the two countries and from their economic structure. These will live on, and their character will alter only as modifications develop in the economic systems of Great Britain and Ireland.¹

¹ For the political and national development of Ireland see Chapter IV, pp. 107-115.

CHAPTER VI

SCOTLAND

THE remote and isolated situation of Scotland has fostered in the extreme north of Britain the growth of a nation which long existed as an independent entity. The main island tapers towards the north, contracting still further at two points where firths penetrate deeply into the land. The English type of relief, which allows easy communication from north to south on either side of the Pennines, is replaced at the Border by a transverse grain which places obstacles in the way of movement lengthwise in the island and forms as it were a series of ramparts for the defence of the people living north of them. In these remote northern districts, as in Wales and Ireland, there has been evolved a community strong enough and with sufficient individuality to maintain its national character and, while united with England, to preserve its peculiar temperament right up to our own times.

Yet the Scottish nation, like other communities, would hardly have survived but for the structural and topographical variety of its territory. It consists of an alternation of upland and lowland, of mountain and valley, which differ radically from each other in soil, relief, and economic system. Its three main divisions have a northeast to southwest grain, following the direction of the ancient Caledonian Range. In the north are the Highlands, which are composed of high plateaus of crystalline rocks that break up into groups of islands on the coast; in the south are the Southern Uplands, another plateau of ancient sedimentary rocks which slopes gradually down towards England; and in the centre is the Midland Valley, an area of somewhat broken relief which is pierced by the long estuaries of the Clyde, Forth, and Tay, and which has always been the kernel of the kingdom of Scotland.

1. THE HIGHLANDS

SCENERY. The mass of crystalline rocks which compose the Highlands is divided into three parts by two great depressions: Glen More, narrow and wholly above sea level, and the Minch, which is broad and submerged. Glen More follows a very ancient structural fracture zone which runs northeast-southwest and still suffers from

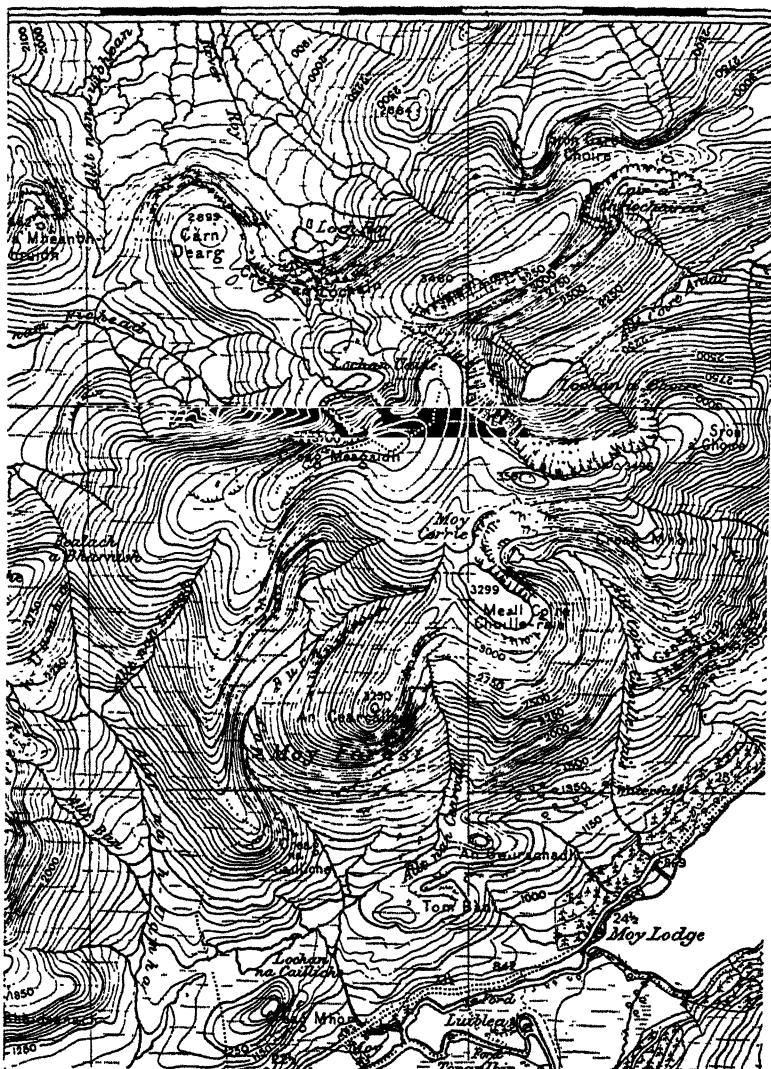


FIG. 40. Glaciation in the Highlands. The central peak of Creag Meagaidh is fluted with corries, some of which contain tarns (lochans), like Lochan a Choire. In the south a portion of Glen Spean can be seen, with the end of Loch Laggan. [Reproduced from the Ordnance Survey, inch-to-the-mile Map, with the Sanction of the Controller of H.M. Stationery Office.]

earthquakes. It separates the Northwestern from the Central Highlands. The Minch, a channel 150 miles long with an average

breadth of 30 miles, is a rift of fairly recent origin and divides the Outer Hebrides from the mainland.

Except for a few bold peaks which rise above the general level, and the deep notches of the corries which are incised in the western mountain-tops, the surface of these plateaus is surprisingly regular. The summit elevations show that if all the valleys in the Central Highlands were filled in, the plateau-face would be almost uniform and would slope gently down to the southeast. Reading in each case from west to east, Ben Nevis and Ben Macdui in the north rise respectively to 4406 and 4296 feet ; in the centre Ben Lawers (3984 feet) and Lochnagar (3786 feet) are slightly lower ; and in the south Ben Lomond (3192 feet), Ben Vorlich (3224 feet), and Ben Ledi (2875 feet) are still less elevated. The characteristic Highland landscape consists of broad expanses of almost treeless upland moors. Except on the steepest slopes, the hills are covered with a mantle of peat, in which streams rise and carve their beds. Hidden in the black mass, the water buries itself in deep channels or in tunnels whose feeble roofs give way beneath one's feet (see Plates I, II and XXIIIB).

Between the eastern and western portions of the Highlands there are differences of relief and scenery which are due to the longer and more vigorous glaciation and to the greater height and more resistant rocks of the western parts. In the west corries gash the humpy peaks, and their recent forms, knife-edge ridges, and jagged rocks add a touch of wildness to the quieter aspect of the old mountains (see Fig. 40). Goat Fell in Arran has ten corries, all of which face east or northeast and are separated by sharp ridges and scarped slopes. The northern flank of Ben Nevis is pock-marked with large hollows in which snow remains right into the summer. Nowhere else do sea and mountain combine to offer scenery of wilder beauty. Outlying mountains rise from the sea as islands or peninsulas ; sea-lochs penetrate deeply up the valleys and drown the beds of former inland lochs ; and mighty wave-stricken cliffs frown over an ever stormy ocean. The topographical forms vary with the rocks, the most curious being the basaltic flows which in Skye constitute a gigantic wall some 90 miles long and reaching to more than 900 feet above the waves (see Plate XXIIIA). Off the coast of Mull rise the famous basaltic columns of Staffa, in which the waves have excavated Fingal's Cave. The roof of this cavern is 60 feet above the sea. At high tide the waves rush into it with a roar, whilst at low tide it is possible to reach its inner end by climbing over the rocks.

A fringe of islands and peninsulas borders the west coast of the Highlands. In the south are Bute, Arran, the Mull of Kintyre, Jura,



FIG. 41. Planation on the Island of Lewis. In general, the grain of the relief corresponds to the direction in which the ancient ice-cap moved. [Reproduced from the Ordnance Survey, inch-to-the-mile Map, with the Sanction of the Controller of H.M. Stationery Office.]

and Islay; then follows the long line of islands including Sleat (a part of Skye), Eigg, Coll, and Tiree, ending in the Skerryvore Rocks. Nearer the coast are the Inner Hebrides, consisting of Mull and Skye, whilst beyond the Minch are the Outer Hebrides, comprising

Lewis, Harris, and North and South Uist. Finally, beyond the Pentland Firth are the Orkneys and Shetlands. The alignment of the Outer Hebrides is so regular as to give the appearance of a single island, which is known to the Scots as 'Long Island'; but in fact they are composed of a number of pieces of land, between which the tides flow violently. Sometimes the realms of sea and land are dovetailed into each other and are scarcely distinguishable (see Plate VII B). At Lochmaddy, in North Uist, a distance of a little over half a mile as the crow flies involves an overland journey of three or four miles round the creeks. Lines of inland and sea-lochs running southeast-northwest (see Fig. 41), ice-riden humps, piles of pebbles, and swarms of lakes bear evidence of glacial action in every corner of the landscape. 'Peat, water, and rock everywhere,' writes Geikie; 'everywhere rock, water, and peat.'

The Orkneys can only be reached by crossing the six miles of the Pentland Firth, through whose narrow sound the tidal streams rush so violently that the island of Stroma is sometimes hidden in spray. Fortunately, air services, which cross from Wick to Kirkwall in 20 minutes, now enable passengers to avoid the unpleasant sea journey. The group comprises twenty-eight inhabited and twenty-nine uninhabited islands, not counting rocks and reefs. They are formed of the same Old Red Sandstone as Caithness on the mainland opposite. A channel 50 miles in width, in the midst of which rise the cliffs of Fair Isle, separates the Shetlands from the Orkneys. Their crystalline schists and Old Red Sandstone prove them to be also a fragment of Scotland, but they are loftier, wilder, and more ragged in shape than the Orkneys. Firths, sounds, and voes penetrate them in all directions. Thirty miles to the west of Scalloway lies the isolated island of Foula, whose vertical cliffs rise to 1650 feet above the waves. 'Birds wheel in thousands around the cliffs,' writes Élisée Reclus; 'fowlers trying to collect eggs or young birds must rope themselves to crags and swing in space as they lower themselves down the precipice.'

In the eastern portions of the Highlands, and especially in the Central mass, there are fewer crags and other rocky features on the tops of the mountains, fewer gashes in the bed-rock, and fewer lakes; the general plateau-surface is of a more mature and regular topography, and there are even fairly wide plains on the coast. Off the shore there are no fragments of land to form islands, and the coast itself has few bights and indentations. Large estuaries are found only in the deep re-entrant containing Dornoch, Cromarty, and Moray Firths. Furthermore, these inlets are essentially different from the western sea-lochs, for their flat shores are formed of alluvium, their beds are being silted up, and their mouths are

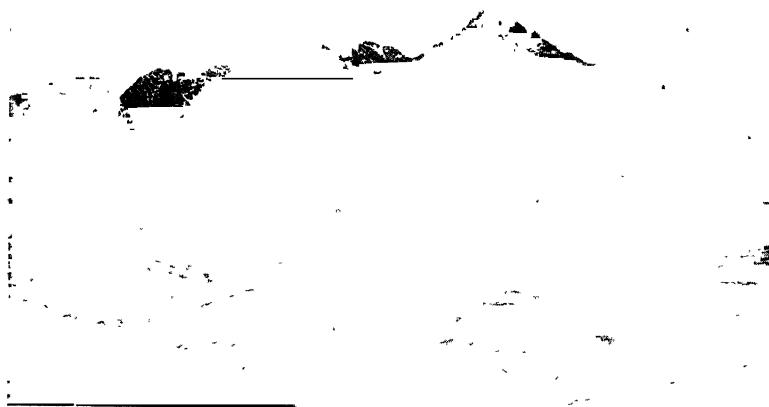
impeded by sandbanks. Dornoch Firth is rapidly decreasing in size owing to the deposition of sand on its shores, and it can only be navigated along complicated channels which thread their way among sandbanks. At the mouth of the inner basin of the Moray Firth two sandspits, one starting from Fortrose and the other occupied by Fort George, run out towards each other from opposite sides of the estuary. In its coastal topography, as in its relief, the eastern parts of the Highlands show signs of greater maturity than the west (see Plate VIII).

Two valley systems cut up the Highland plateaus into numerous sections and hill-masses. In one system the valleys are longitudinal and run northeast-southwest, following the structural lines ; in the other they are transverse and lie along the general slope of the Highlands from northwest to southeast. Whatever their direction and origin may be, they belong to two distinct types of relief and are distinguished in popular language by the terms 'strath' and 'glen.' Whilst the glen is typically the upper part of the valley, the strath is the lower portion and is wider and at a far lower level. In it the streams lose their torrential character and flow between knolls, hillocks, and ridges of gravel, sand, or clay, sometimes meandering along and almost losing themselves in marshes. Big lakes do not occur, and the wild mountain scenery gives way to gentler and less sombre features, to fringes of woodland, meadows, fields, lines of trees, and cottages. Straths belong essentially to the eastern parts of the Highlands.

On the other hand, the glens are narrow mountain valleys, their scenery is desolate, and their vegetation scanty. They bristle with a confusion of stones, are saturated with trickling, black water, and are sometimes occupied by long ribbon-lakes. These lakes fill rock basins scooped out by ice. Lochs Lomond, Morar, Maree, and Assynt each adorn a glen. Their dark surfaces, wall-like sides, their islands polished into *roches moutonnées*, the fringe of trees that shades their banks, the desolate moorland on the slopes above, and the ragged outline of corrie-notched peaks nearby are all features that go to make scenery of a stern and gloomy grandeur (see Plates IVB, V, VIIA, XXIV_A, and XXVIIA).

THE ECONOMIC SYSTEM OF THE HIGHLANDS. The mountainous nature of the Highlands, their thin soil, and high latitude make the district unfavourable to agriculture. Arable land is restricted to the alluvial valley bottoms and the belt of raised beaches along the bays and estuaries. The 900-foot contour is the upper limit of cultivation, and waste land covers immense areas. Moorland occupies nearly nine-tenths of the parish of Kingussie in Inverness-shire, whilst only 2 per cent. of the surface of Sutherland is arable. Fields

PLATE XXIII



[Crown Copyright.]

A. THE CUILLIN HILLS IN SKYE

The massive volcanic rock has been eroded into peaks under which corries have been formed.

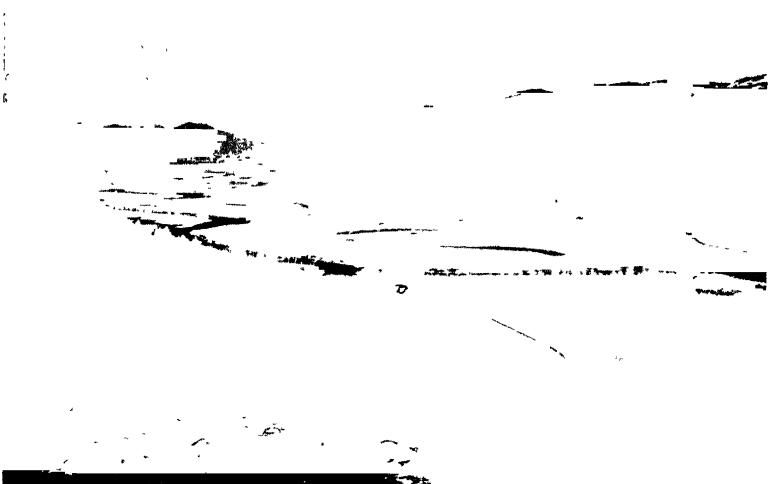


[Crown Copyright.]

B. A HIGHLAND LANDSCAPE

The view includes part of Argyll and Inverness-shire. The mountains in the foreground are separated from those in the background by Glen Leven, in whose bottom a loch may be seen. The dam for the production of hydro-electricity is too small to appear in the photograph.

PLATE XXIV



[Crown Copyright.]

A. STRATH GLASS IN INVERNESS-SHIRE

This valley, which is some 10 miles southwest of Beauly, is wide and U-shaped, but its bottom has been filled with pebbly alluvium, forming a plain in which the river meanders uncertainly. Several abandoned meanders are visible.



[Photo: Valentine.]

B. STIRLING FROM ABBEY CRAIG

In the foreground are open fields fringing a meander of the Forth; in the middle ground is the town resting on a volcanic neck; in the background are moss-covered hills with smooth outline.

and pastures hardly occur except on the marginal plain and in the bottoms of the larger valleys on the east coast. The soil is nearly always too sandy, gravelly, thin, permeable, and poor in plant food to yield good crops. Except in the better farms in the east, the only manure used is the litter gathered from the moors for the bedding of the stock. In many parts the crofters, or little tenants, carry into the byres clods of turf, bundles of heather, and seaweed, which in spring are taken out as manure. This vegetable mould and the winter accumulation of dung are spread over the field adjoining the farmhouse. In days gone by there was sometimes added to this the soot cleaned off the interior of the houses, the crofters' dwellings having no chimneys.¹ Such land cannot yield good harvests. To the poor nature of the soil must be added the drawbacks of a damp climate which often spoils the seeds sown in autumn and spring and, through lack of sunshine, the harvests in summer. But the east has great advantages over the west, since its summers are warmer, its skies less cloudy, and its rainfall lower. In the east wheat is grown as far north as Ross, though in the west its cultivation does not go beyond the Firth of Clyde. In Aberdeenshire oats will do well above the 1600-foot contour, because the crop benefits all the more at this elevation from the long summer days proper to this latitude.

Oats, the chief Scottish grain, cover 35 per cent. of the arable land in Sutherland, 20 per cent. in Inverness-shire, 33 per cent. in Banffshire, and 26 per cent. of the total arable of the whole country. From it is made the oatmeal which is eaten as porridge. In addition, potatoes occupy 4 or 5 per cent. of the arable, and barley some 4 or 5 per cent. All the rest of the cultivable land is devoted to crops intended for feeding stock. In Sutherland turnips occupy 10 per cent. of the arable, and pasture 40 per cent. The percentages are even greater in many other counties ; thus, 48 per cent. of the arable in Banff and 60 per cent. in Inverness-shire is under grass. During the past fifty years fodder crops have been on the increase throughout the country. In fact, pastoral production is the true occupation of the inhabitants of this land of grass and moor.

The Highlands support large flocks of sheep. A great deal of the moorland areas is divided into a few huge sheep farms. In Sutherland these occupy half the county. The animals are raised in the mountains, but taken to the fertile plains of Aberdeenshire to be fattened. Hence, there is a regular flow of stock from the uplands to the plains. Sheep-breeding is the main occupation in the hills, and the most mountainous counties—Sutherland, Ross, Inverness, and Perth—contain the largest number of the animals. On the other

¹ A few of these so-called 'black houses' still survive in the Outer Hebrides.

hand, there are more cattle in the lowland pastures of the straths and plains in the east. In Banffshire and Aberdeenshire, which contain the greatest number of cattle to the square mile, enormous crops of turnips and hay are used for fattening animals of the Aberdeen-Angus and Shorthorn breeds, which are destined for consumption in London and other large towns. This form of pastoral occupation, which is naturally adapted to the country, has been steadily developed since the end of the 18th century.

Other changes have occurred in the utilisation of land. Afforested areas have become a familiar sight in the Highlands. Trees will not grow well everywhere, owing to the effects of strong winds from the sea and to the expanses of peaty soil. But the same great landowners who created the large sheep farms have had wide areas afforested. Between 1774 and 1826 the Duke of Atholl planted 14 million trees, mostly larches, which now form a forest nearly 10,000 acres in extent near Dunkeld. Since then afforestation has continued steadily, and the forests are slowly being re-established. In Sutherland alone the area of woodland has risen from something under 8330 acres in 1870 to more than 36,000 acres to-day.

In recent years, the mountain streams have been harnessed to produce electric power either for use in a local industry, like the aluminium factory at Kinlochleven, or to supply the national grid.

Yet the keynote of the countryside is its solitude, and this characteristic is intensified by every step of man's encroachment on the pasturelands to provide recreation for himself. Vast stretches of moorland have been turned into game preserves for grouse-shooting and deer-stalking, into 'deer forests' which are closed to stock. Many sheep farms and many areas of common pastureland have been swallowed up in huge hunting-grounds, for whose use there is great competition among the English upper classes, merchants, and wealthy industrialists, and even American millionaires. It pays the owner far better to hire out his waste land than to use it as pasture for sheep. In Inverness-shire alone deer forests cover 38 per cent. of the total area, whilst nearly the whole of Sutherland is divided between ten large 'shoots.' Hence, these areas have a very small population. Though the Highlands occupy six-tenths of the surface of Scotland, they contain less than a tenth of the people. There are only 8 persons to the square mile in Sutherland, 20 in Inverness-shire and Argyll, and 20·5 in Ross. Yet this density is too great for the poverty of the land and makes emigration necessary. From the middle of the 19th century the Highlands have sent out an average of 20,000 emigrants a year to Canada, Nova Scotia, the United States, and Australia. The movement has continued to the present day, but is now directed

mainly towards the great urban centres in England and Scotland. In the eastern counties and in the islands of the north there is greater density of population, however, for the Orkneys contain 62 persons to the square mile, the Shetlands 44, Aberdeenshire 150, and Elgin 90. This difference in distribution of population is due to the fundamental difference mentioned above between the western and eastern parts of the Highlands. The west is a mass of mountains whose only area below the 500-foot contour is a narrow strip along the coast and in the lower valley bottoms ; whilst in the east the mountains are broken by valleys which widen out into plains, and the climate is sunnier and less damp.

URBAN CENTRES IN THE HIGHLANDS. In the barren, difficult regions of the Western Highlands which face the rough and foggy Atlantic, urban communities are rare, apart from the hamlets and villages inhabited by farmer-fishermen, which line the raised beaches (see Plate VI B). The towns are small and occur only at railway *termini*, at points where boats call, at landing-places in the islands, and in the bays which afford the best fishing. These are Campbeltown, Rothesay, Oban, Portree, and Stornoway (see Plate XXVI B). The first and the last of these, together with Kirkwall and Lerwick, are now connected by air services with Glasgow, Aberdeen, and Inverness.

Overland communication between the urban centres is difficult along the coast. But three railway lines run across the country to their respective *termini* at Oban, Mallaig, and Lochalsh, thus establishing rapid communication with the larger islands of Mull, Skye, and Lewis. The sea is the real means of communication and connects the district with Glasgow, on which it depends. Traffic moves through the sounds under shelter of the islands, as in Norway.

On the east coast the district bordering on the Moray Firth presents a different picture. Around Dingwall, Beauly, Inverness, and Elgin the relief is less rugged, the low ground is occupied by cultivated fields and orchards, and a number of farms appear through the curtain of trees close to the calm water of the firth whose arms penetrate into the expanse of verdure. Agriculture and sea-faring occupations flourish, and there are many towns. Nine-tenths of the population of the Highlands are concentrated in this fertile district. Ballater, Grantown, Dornoch, and Inverness are market towns, whilst in the straths, where the climate is mild and relatively dry, there lie the summer resorts of Braemar and Ballater in the Dee valley, Kingussie in Strathspey, and Blair Atholl in Glengarry.

The sea is the chief factor in this concentration of population and in the growth of towns. The abundance of fish in the North Sea has given rise to a string of fishing ports stretching from Aberdeen to

Wick and beyond this to Shetland. This remote group contains 21,400 inhabitants, which is a great deal for so barren a land. Little return can be expected from the soil in these distant, treeless islands which are so cold that spring does not begin till April and summer ends in August, and which are so far north that daylight lasts through the summer nights, whilst the days are almost dark in winter. Hence, men earn their living by the sea. Many Shetland boats join the international fleet which fishes for herring every year off the islands. From June 1st to July 15th the fishing is carried on mainly to the north of the Shetlands. A temporary village of wooden huts has been built along the wharves in the little harbour of Balta Sound. Between 8000 and 9000 people, mostly women, flock to this spot from Norway, Scotland, and England to clean, salt, and pack the herrings. Nearly 1500 English, Scottish, Dutch, Swedish, Norwegian, and German boats land their daily catch here, and for six weeks the work goes on feverishly. About the middle of July the place becomes empty, the shops shut, and solitude reigns once more. From July 15th till September the fishing centre is moved farther south (see Fig. 17) to Lerwick (pop. 4200), which itself has more than a thousand boats. The same workers, the same vessels flock thither, and the same busy scene recurs. With the arrival of shorter days and bad weather in September, the work stops, and cargoes of herrings are despatched in barrels to the Baltic countries. Similarly, Kirkwall in Orkney sends out about a hundred fishing boats, and these operate as far south as Lowestoft.

Thurso, which was once the centre of Scottish trade with Scandinavia, is now only a local port and ships large cargoes of paving-stones, known as Caithness flags, quarried from the Old Red Sandstone in the neighbourhood. The line of Scottish fishing ports which continues as far as Aberdeen begins at Wick. The season in these ports lasts from the end of July to the beginning of September and brings with it a great deal of bustle, sometimes doubling the population of some of the towns through the inflow of workers engaged by the curing factories. The 7500 inhabitants of Wick live on the herring fishery. Pulteneytown, a suburb built in 1808 by the British Fisheries Association, has a deep harbour giving access to the boats at all states of the tide. The season and bustle are the same at Buckie (pop. 8700), Cullen, Banff, Macduff, Fraserburgh (pop. 9700), and Peterhead (pop. 12,500). In all of them King Herring rules men's lives and fortunes.

The only large town in the Highlands and the most northerly in the British Isles is Aberdeen. Its population numbered 18,000 in 1801, 44,000 in 1851, and 161,300 in 1931. It occupies a classic site at the head of the tidal estuary of the Dee, near the point at which

the Don reaches the sea, and so it commands two valleys which run far back into the Grampians. The rapid growth of the town in modern times dates from the construction of its two wet docks which give a safe haven to trading and fishing vessels and enable them to berth and sail regularly. More than 250 steam trawlers from

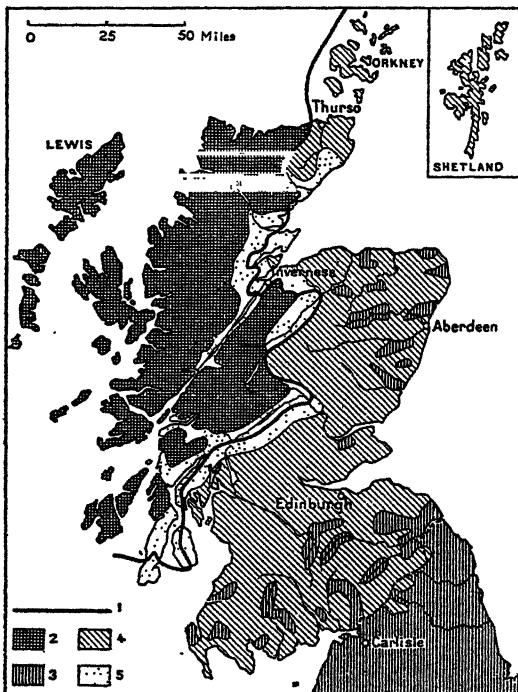


FIG. 42. Distribution of the Gaelic Language in Scotland. (After Bosse.)

1. Eastern limit of the area in which more than 50 per cent. of the population habitually use the Gaelic tongue or can speak it.
2. Areas in which 75 per cent. of the population speak Gaelic.
3. Areas in which English only is spoken.
4. Areas in which 75 per cent. of the population normally speak English.
5. Areas in which the two tongues are nearly evenly distributed.

Aberdeen frequent the Great Fisher Bank. Besides the preparation of smoked and salted herrings and cod (see Plate XII), which is the traditional form of treating fish in Scotland, Aberdeen deals in fresh fish, distributing it by means of express trains to the towns in the south. One-third of the fish caught in Scottish boats is landed at Aberdeen. The town is run by fish merchants and others connected with the trade, and fish is the main source of work and livelihood.

Smoked herrings, whether kippers or bloaters, are despatched in boxes ; salted herrings are packed in barrels ; smoked haddock is prepared for the English breakfast table ; and the more dainty fish is transported in ice. Aberdeen ranks with Hull, Grimsby, Yarmouth, and Lowestoft among the chief fishing centres on the east coast of Britain. The great town is responsible for the close connexion of the Highlands with the general life of the North Sea.

Rising behind the east coast, whose gates open on to the main highways of the sea, the Highlands are still rather isolated and seem proof against outside influences. Waves of foreign invasion have dashed against them without effect. They are the last stronghold of Gaelic, since according to the census of 1931 there were 7069 persons who spoke Gaelic only, whilst 137,149 others spoke both English and Gaelic (see Fig. 42). Up to the 18th century the Highlanders kept their ancient customs, their organisation in clans distinguished by their tartans and their war-cries ; and they still continued their feuds and tribal quarrels. Highlanders of those days are described as a race of raiding and plundering herdsmen who were a terror to the 'bread eaters' of the Lowlands, and whose adjacent landlords were wont to pay a kind of tribute known as 'blackmail' to the chiefs of the clans. The old pastoral habits were replaced by modern sheep farming in the 19th century, when the country was invaded by swarms of noisy trippers, by shooting parties, and by the railways. The change took place slowly, for natural peculiarities helped the strength of tradition to check the new ways of life. There were no roads in Sutherland before the 19th century, and until 1811 Dornoch and Oykell Firths could only be crossed by ferry. The Caledonian Canal, constructed by means of twenty-eight locks through Glen More between 1804 and 1822, has never been of more than local use, though it was intended as a main highway between the two seas. The Highland Railway was not opened until 1863 and reached Thurso only in 1874. The east-to-west railways are more recent, that to Strome Ferry (Lochalsh) having been built in 1870, that to Oban in 1880, and that to Mallaig in 1901. These changes have by no means effaced the rugged peculiarities of the Highlands. In their desolate moors and among the cottages, with their smoke-grimed dry-walls and their roofs of turf or reed-thatch, it is still possible to breathe a calm and healthy old-world atmosphere.

2. THE MIDLAND VALLEY

Between the ancient massifs of the Highlands and Southern Uplands lies an uneven plain running southwest-to-northeast with the general grain of the land (see Fig. 43). As the estuaries penetrate

far inland here, the plain is very narrow, occupying scarcely one-fourth of the surface of Scotland. But this slip of land, the Midland Valley, has been for centuries the centre of Scottish life, owing to the

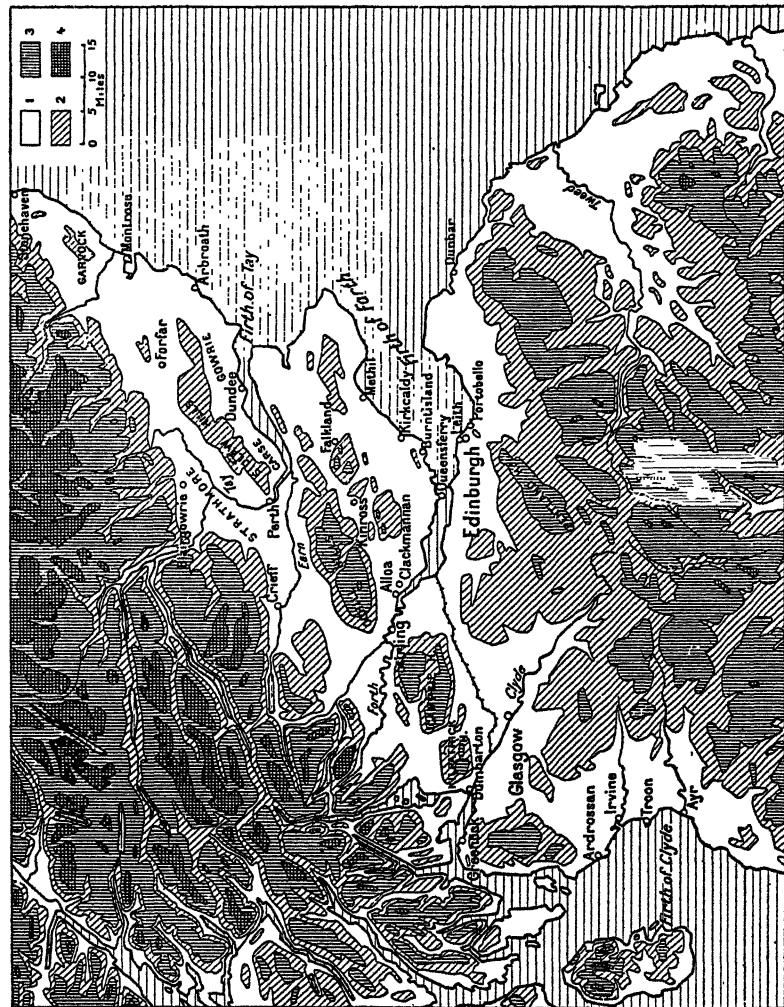


FIG. 43. Relief of the Midland Valley.

- 1. Less than 500 feet above O.D.
- 2. Between 500 and 1000 feet.
- 3. Between 1000 and 2000 feet.
- 4. Exceeding 2000 feet.

fertility of its valleys, its contact with the sea, its mineral wealth, and its ease of communication. Two-thirds of the population of Scotland are crowded into it, and it contains the second largest town in the British Isles, viz. Glasgow, with more than a million inhabitants.

THE COUNTRYSIDE IN ITS NATURAL AND CULTIVATED ASPECTS.

The Midland Valley is a rift bounded on the north and south by almost rectilinear faults. The mighty trench is floored with Devonian and Carboniferous rocks, consisting of red sandstone, shales, coal measures, clays, limestones, and various other rocks, among which are intrusions of resistant masses of eruptive material. The relief is wholly due to the occurrence of these different rocks side by side. Relatively soft sediments have yielded hollows and local plains, whilst the outcrops of eruptive rocks stand out as hills, ridges, and escarpments which have had a predominating influence on the details of the relief. They form two lines of hills in the midst of the Valley. The more northerly runs northeast-to-southwest and includes the Garvoch, Sidlaw, Ochill, Campsie, and Kilpatrick Hills, together with the heights lying between Greenock and Ardrossan. The more southerly comprises the Garleton and Pentland Hills and the heights rising to the southwest of the Clyde valley. Between the two lines rise many isolated hillocks which are outcrops of eruptive rock and which give variety, abruptness, and irregularity to the scenery. Sometimes they form lines of flat-topped elevations like the Bathgate Hills, the Salisbury Crags, and the Lomonds of Fife ; at other times they are rocky crags which rise abruptly from the plain to form the curious hills of Fife (including the Binn of Burntisland, the Hill of Beath, and Tor Hill) and the three volcanic necks of Traprain Law, North Berwick Law (see Plate VI A), and the Bass Rock. In some cases they give rise to precipitous rocks which have been used as sites for splendid castles like those of Edinburgh, Dunbarton, and Stirling (see Plate XXIV B).

In fact, the Midland Valley is by no means a plain, for high ground meets the eye in all directions. Like certain districts in Ireland and the Welsh Marches, they consist rather of a network of hollows and valleys winding between high ground. Below the 900-foot contour, the depressions contain good alluvial soil which has given the country its agricultural wealth. The Forth valley is proverbial for its fertility. As the saying goes, ' Better a link of Forth than the province of Moray.' The Midland Valley has always been a rich area.

The scenery of the agricultural portions of the Valley is the work of man. The spirit of progress, which had its origin in English industrialism, found adepts among the great landowners, and by the end of the 18th century common land had begun to disappear and the system of enclosures to become general. There came into being a class of farmer whose holding comprised on the average some 150 to 200 acres and was held on a very long lease. The landowners helped to improve agriculture by draining swamps and, after 1720,

by introducing the use of clover and artificial fodder crops. Wheat took its place in the rotation of crops along with the traditional oats and barley. Historical documents record as a sensational event the sowing of a seven-acre field with wheat near Edinburgh in 1727. In recent times Scottish agriculturalists have quickly reacted to the fall in the price of corn in the world market and have turned towards pastoral production.

The eastern portion of the Valley is famous for its fertility, especially Strathmore, the plains of Fife and Forfar with the Carse o' Gowrie, and, on the south bank of the Forth, the district around Edinburgh and the Lothians generally. Fields of oats, barley, turnips, potatoes, clover, and lucerne cover a greater area in Forfar and Fife than in any other part of the country. Since the climate is relatively dry, farms occupy slopes up to the 1250-foot contour. The fattening of sheep on turnips, the cultivation of new potatoes, and the breeding of milch cows are among the most paying enterprises. At the foot of the Sidlaw Hills from Perth to Dundee stretch the fertile acres of the Carse o' Gowrie. The land is here divided into large fields surrounded by hedges and trees. They either carry cereals or greens and artificial fodder crops; or they are under hay and are dotted with haystacks; or else they are under grass on which stock is being fattened. In the orchards that grow around the homesteads apple, pear, plum, and cherry trees spread out their leafy foliage, under which flourish thick growths of gooseberries and raspberries. The Carse is the golden girdle of the banks of the Tay. Farther north from Stonehaven to Perth cultivation is equally vigorous in Strathmore. But it is even more so in the Lothians, where modern agriculture first took root. There wheat and barley give greater yields than in any other part of Britain; Dunbar potatoes, nurseries of trees and shrubs, and flower gardens offer abundant returns. The density of town population encourages agricultural production, and barren soils are improved and brought under cultivation. Between Leith and Portobello large sandy areas in the Craigentinny moors have, through the use of sewage from Edinburgh, been turned into fat grazing land for feeding milch cows and also oxen destined for the slaughter-house. As elsewhere throughout Britain, the richness of the soil dates from the time when land was pressed into the service of the large towns and industrial centres.

TOWN LIFE IN THE FORTH AND TAY DISTRICTS. The large number of little towns in the east of the Midland Valley points to the wealth and long-established geographical advantages which exist here. Where valleys enter the plain along the line of contact between the Highlands and Lowlands there is a row of market towns and villages, including Crieff, Dunkeld, Blairgowrie, and

Stonehaven, where Highlanders and Lowlanders have been wont to mingle for long ages. Another series of towns, including Forfar, Kinross, Clackmannan, and St. Andrews, are scattered among the straths and fertile plains, where they act as agricultural centres. Stirling and Perth owe their greater prominence to their geographical positions. Each of them stands on a river at a point where the stream issues from a gorge in the Sidlaws or Ochills and is bridged at the head of its tidal estuary. Moreover, they both guard a historic route to the Highlands. Stirling (pop. 22,600) stands on a river terrace on the right bank of the Forth and is commanded by a volcanic neck on which its ancient castle was built. The part it formerly played as a bridgehead survives today in its function as a railway junction. Perth (pop. 34,800), which stands on a terrace above the Tay, guards another route. It was once a Roman station, then the residence of the Scottish kings; but, though it was a busy port in the Middle Ages, it would be an unimportant town today but for its linen and jute mills.

Towns occur most frequently on the coast and more especially along the Forth. The estuary of this river may be said to be bordered with coalfields. On the south bank lies the Lothian field, whose forty-six seams give a total thickness of nearly 130 feet of coal. The outcrop is interrupted by the Forth, but reappears on the north bank in the Fifeshire coalfield. Farther west at the head of the estuary and on its northern bank is the Clackmannan coalfield, which passes under the river to join the big Lanarkshire field. Coal is mined both under the river bed and on the banks. The little island of Preston opposite Bo'ness contains a mineshaft. At Bridgeness coal is mined 400 to 500 feet under the river beneath a thick layer of clay which forms the impermeable bed of the Forth. The coal has been worked in the district since the 13th century. The abundance of fuel led to the establishment in 1760 of the large Carron Ironworks on the banks of the Carron not far from Falkirk. Now that the ironworks have migrated to the Glasgow district, large quantities of coal are available for export from the Forth. Hence, this fuel is shipped from all the ports on the estuary, including Leith, Burntisland, Methil, Alloa, Bridgeness, Bo'ness, and Grangemouth. The annual quantity before 1939 amounted to nine million tons. These towns are all growing apace. Between 1850 and the present day Grangemouth has increased its population from 2000 to 11,800, and Bo'ness from 1800 to 10,000.

One of the two important oilfields in Britain is worked in Linlithgow and Midlothian on the south bank of the Forth. In 1934, the quantity of oil distilled from carboniferous shales amounted to 64,000,000 gallons; in 1945 it had risen to 119,000,000 gallons. It is

PLATE XXV



[Photo: Valentine.

EDINBURGH

In the centre of the photograph is the valley through which the railway runs. Behind it is Castle Rock, the original site of the town. On the right is Princes Street, the main thoroughfare of the city, with Scott's monument.

PLATE XXVI



[Photo. Valentine.

A. FISHERMEN'S HUTS AND BOATS AT BARRA IN THE HEBRIDES
The photograph shows a sheltered sound; the bare, treeless country; and the fishermen's huts built with dry walls and thatched with reeds



[Photo: Valentine.

B. STORNOWAY

A little fishing port on Harris in the Outer Hebrides. The surrounding country is ice-planed and pierced by numerous inlets of the sea.

used mainly for lighting. The two little counties containing the wells and refineries have increased their population by 400 per cent. since the beginning of the 19th century.

The production of linen, jute, and coarse cloths, which is centred on the banks of the Firth of Tay in Forfar and Fifeshire, is an industry of long standing. The towns connected with it line the coast from Dundee to the Forth. Dunfermline (pop. 35,000) produces best quality cloths and damasks ; Kirkcaldy (pop. 44,000) manufactures oilcloth and linoleum. The bleaching and dye works at Perth are connected with the group. Farther north Arbroath and Montrose turn out coarser cloth. But the centre of linen and jute manufacture is Dundee, which sprawls out along the north bank of the Tay. For long it was mainly a fishing port, taking part in whale-fishery and doing some shipbuilding ; but now it has only a few whaling vessels, though its trawlers still operate on the grounds near Bell Rock. Its textile industry has supplanted all others and practically concentrates in the town and its immediate neighbourhood the whole of the linen, hemp, and jute manufactures of Britain. Its factories produce coarse cloths, sacking, canvas, and carpets and employ 35,000 hands. Up to 1880 Dundee had no competitor ; but Calcutta and other towns have invaded its monopoly. Hence, it is daily tending more and more towards the manufacture of ropes and hawsers and towards the production of yarn which is sent abroad to be woven. Nevertheless, the treatment of fibres remains the principal activity of the town and its port, raw materials for textiles forming more than four-fifths of the value of the imported goods, and textile products bearing the same proportion to the total exports. As raw jute arrives during five months only, the docks have had to be enlarged several times. Owing to the proximity of the fruit-growing Carse o' Gowrie, jam-making has sprung up in Dundee and has assumed huge dimensions. It ranges from the production of jam from local fruit to that of marmalade from imported oranges. Hence, sugar figures largely among the imports. The convenience of well-appointed docks have attracted other industries, such as engineering works for the production of machinery for the jute industry the world over, as well as shipyards, sawmills, and papermills. Owing to its development into a great industrial town, Dundee has increased its population enormously. The number of its inhabitants rose from 21,000 in 1801 to 61,000 in 1851 and 175,000 in 1931.

EDINBURGH. Geographical causes placed the capital of Scotland near the Forth. The fertile lowlands which border the Forth and Tay afford a natural route from north to south for both trade and war. In the past, successive capitals have been established along this

route at Perth, Stirling, Dunfermline, and Edinburgh, to hold the line of communications. Modern engineering has strengthened its importance even more. At Queensferry, where the Forth narrows, the Forth Bridge was built in 1890 to avoid the roundabout way through Stirling and to take the railway from Edinburgh to Perth and Dundee (see Plate LVA). Farther north another great viaduct



FIG. 44. Edinburgh and its Neighbourhood. Heights in feet.

nearly two miles long crosses the Tay near Dundee, thus shortening still more the distance between Edinburgh and the north.

Edinburgh stands in a splendid position on this historic highway at a point where the belt of lowland narrows between the Pentland Hills and the shores of the Forth. It is built on volcanic necks which stand up abruptly from the plain. The first to be occupied were Castle Rock and Calton Hill. Later, the growth of the town gradually spread round Arthur's Seat on the east, Corstorphine Hill on the west, and Blackford Hill on the south (see Fig. 45). Castle

Rock, the smallest and lowest of these necks, though not the least easy to defend, determined the site of the original fortress and, like the Acropolis at Athens, became the nucleus of the town. Taken and retaken again and again by English and Scots, it remained

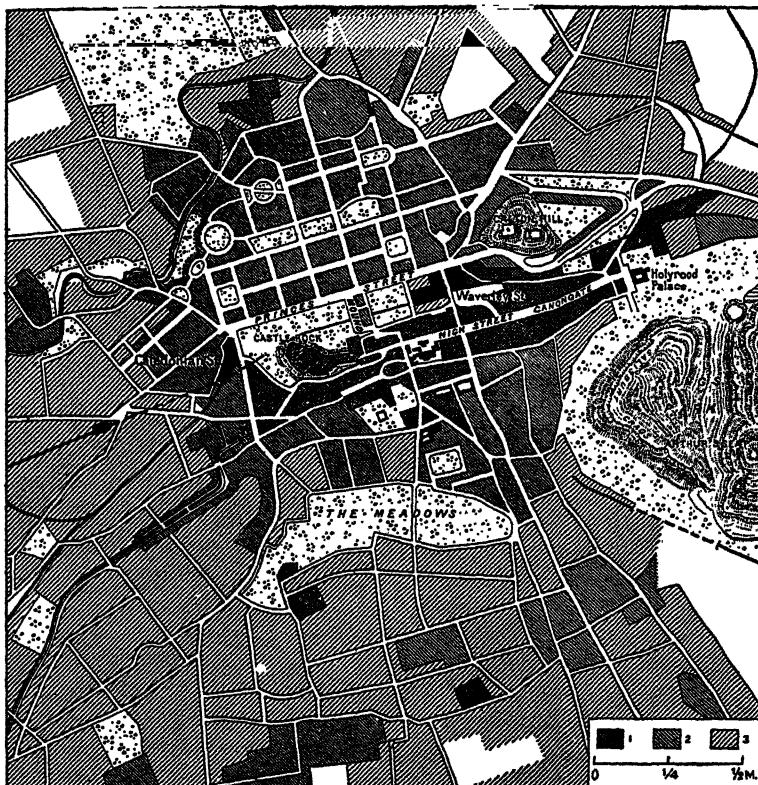


FIG. 45. Growth of Edinburgh.

1. The City in 1750.
2. Additions between 1750 and 1840.
3. Development since 1840.

finally in Scottish hands after 1341, and in the middle of the 15th century it replaced Perth as the capital of Scotland.

The Castle stands on the western slope of the Rock, while at the eastern end is Holyrood Abbey, founded in 1218 by David I. Near the latter is the royal palace. Between the Castle and the Abbey the town grew up along the connecting highway, which is now known as High Street and Canongate. The houses are tightly packed

within these precincts. As population increased, the town could not expand in area ; so it grew in height. This oldest portion of Edinburgh is still marked by closely built, lofty houses, narrow blind alleys, winding streets, and all that picturesque, though filthy, disorder which modern hygiene will soon dispose of. Up to the end of the 18th century the town spread southwards, gradually covering all the slopes of Castle Rock and even overflowing on to the level ground near the foot of the hill. All the historic monuments and public buildings of the capital, including the Castle, the Houses of Parliament, the Law Courts, the Cathedral of St. Giles, the University, and some museums, lie within the city as it was at the end of the 18th century.

In this period of economic development and prosperity new quarters were built on a methodical plan and formed as it were a second town to the north of the old city on a rise running parallel with Castle Rock and separated from it by a ravine. This new part of the city is classical in style and is regularly and spaciously laid out with straight streets and large squares. The main thoroughfare of the modern town and the busiest in the whole city is Princes Street, a wide highway with hotels, clubs, and smart shops along it. Overlooking the ravine, whose bottom is laid out in beautiful gardens, it commands a picturesque view of the old Castle. At each end of the ravine issues the railway from two huge stations, the Waverley and the Princes Street, or 'Caledonian.' The ravine is crossed by two bridges and a viaduct known as the Mound, which join the old town on one hill to the new town on the other. The hills, gardens, trees, majestic monuments, and distant picturesque views give these two parts of central Edinburgh a peculiar charm which is felt in no other city in Britain (see Plate XXV).

Today, both the ancient and the 18th century towns have been swallowed up in 19th century accretions which have made Edinburgh into a typical modern conurbation, sprawling out in all directions. The population has grown from 38,000 in 1801 to 194,000 in 1851, and 439,000 in 1931. The last figure includes Leith, the port of Edinburgh, which is situated just over two miles from the capital. The villages and little towns in the immediate neighbourhood have all become suburbs, and there are summer and seaside resorts at Musselburgh, Portobello, Newhaven, and Granton.

Since as far back as the Middle Ages, Leith has been little more than the port and an industrial satellite of Edinburgh, and its shipping trade has grown with the development of the city. Its functions are faithfully reflected in the nature of the goods which pass through it, for it imports cereals, flour, butter, cheese, eggs, sugar, and other foodstuffs needed by a great urban centre, while its

exports are of no great importance. But for machinery and textiles produced in Glasgow and shipped to the Continent from Leith, there would be no exports except the coal, mineral oil, and sulphate of ammonia from the immediate backland. Shipping facilities have given rise to refineries, rope factories, cloth mills, soap factories, distilleries, and flour mills, nearly all of which supply local needs.

Edinburgh is hardly more an industrial city than it is a seaport, and the city is in some respects unique among the great British towns. In Britain, where centralisation has not proceeded as far as it has in France and other countries, the various national temperaments have not been fused in a common mould. Consequently, Edinburgh remains a purely Scottish capital. It engages in few occupations which do not arise from this function. Its printing-works and publishing firms with their ancillary crafts and manufactures, such as paper and ink, are activities proper to a city which is the intellectual, scientific and legal headquarters of the country. Its great University is famous for its medical faculty and has a fine library, and its learned societies, including the Royal Society of Edinburgh and the Royal Scottish Geographical Society, are of world-wide reputation. Its geographical researches and investigations rest on a foundation laid by great scholars like Sir John Murray, the oceanographer and limnologist, Sir Archibald Geikie the geologist, and Bartholomew the cartographer. The ancient city is very wealthy, and its banking and insurance houses are larger and more numerous than those of Glasgow. Edinburgh rises very far above the status of a provincial or regional capital and is a real metropolis, a capital city by tradition as well as by intellectual and cultural influence.

GLASGOW. In the west of the Midland Plain there has grown up around Glasgow a centre of world-commerce with a swarming population and an immense industrial activity. Yet these conditions do not go far back into the past, since geographical conditions were for long unfavourable. The damp, foggy climate makes the cultivation of cereals difficult and uncertain ; before the engineering works undertaken in the 18th century the Clyde was only a small stream of difficult navigation ; and the district was tucked away in the north and lay opposite unfrequented lochs and sounds. In such poor and isolated surroundings Glasgow long played the modest part of an episcopal see whose diocese extended over barren mountains and of a marketing centre for the islands scattered over a fogbound sea. Its population, which hardly reached 4500 in 1556, numbered only 14,000 in 1661.

The growth of the town dates from the union of England and

Scotland and the consequent opening of trade with the English colonies. Shipping firms and mercantile houses were at once established for this trade. By 1760, Glasgow's tobacco trade exceeded Bristol's ; in 1775 the town imported half the tobacco consumed in Europe ; and it had become the chief European centre for this profitable commodity. A great change came over the place. It began to spread from the neighbourhood of the cathedral, where the old streets bore the names of saints and crafts, to the riverside, where the trade in tobacco, sugar, rum, and cotton gave new street-names like Jamaica Street, India Street, and Havana Street. Colossal fortunes were amassed and with them the means of constructing a great modern port on the Clyde (see Plate XXVII B).

Even in the middle of the 18th century, when Glasgow was rising to the status of a great colonial *entrepot*, the town was not a large port. Many ships could not sail upstream as far as Glasgow and ocean traffic nearly always stopped 18 miles below the town at Port Glasgow, an outport constructed as early as the end of the 18th century. From this point goods were taken overland to Glasgow. The construction of a fairway to Glasgow was necessary for the safety of the overseas trade. At high tide the Clyde was merely a wide sheet of water covering marshy banks, whilst at low tide it was a little stream full of sandbanks and with a depth of only 15 inches in one place. It could be forded 21 miles below the town. The plan for improving the river by constructing embankments to contain the stream and force it to sweep its own bed and for deepening the channel by dredging was proposed in 1773 by Colborne, a famous Scottish engineer. The colossal undertaking, which was begun with primitive dredgers and continued ceaselessly for more than a century with increasingly improved equipment, has turned the Clyde between Glasgow and Port Glasgow into almost as artificial a waterway as the Suez Canal. The maximum draught was raised from $12\frac{1}{2}$ feet in 1821 to 18 feet in 1851, to 23 feet in 1891, and $26\frac{1}{2}$ feet in 1900. At the present day the channel is 25 feet deep at low water and 35 at high tide. Until lately, big ships required two tides for the passage, but now they can leave Glasgow two hours before high water, when the river is 30 feet deep, and reach Greenock in a single tide, either by day or by night, for the fairway is well marked with navigational lights. The docks, which are now accessible to large ocean-going vessels, stretch for $2\frac{1}{2}$ miles along the river bank. Up to 1867 shipping was confined to the Clyde itself, and the quays and wharves were built on the riverside ; but, since the large number of shipyards left little room on the banks, it was decided to construct basins which communicated freely with the river and increased the space available for water traffic. Kingston

Dock was built in 1867, Queen's Dock in 1880, Prince's Dock in 1890, and Rothesay Dock in 1907. The tonnage of ships entering Glasgow from overseas in 1936 amounted to 4,705,000 tons, of which

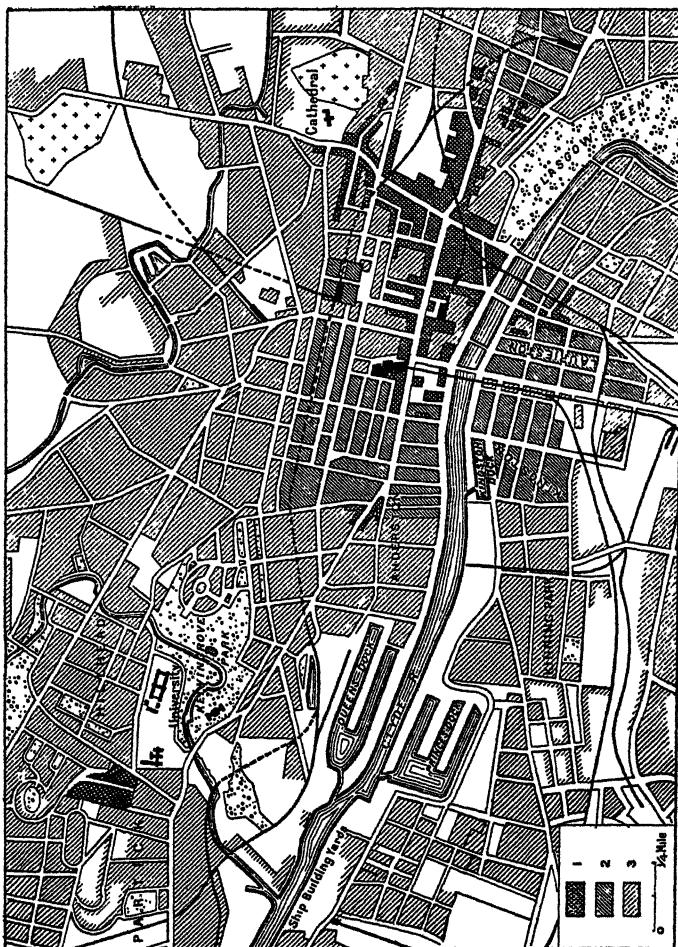


FIG. 46. Growth of Glasgow.
1. Glasgow in 1778. 2. In 1821. 3. Present development.

1,246,000 tons consisted of shipping from the United States and Canada, 509,000 from Australia and New Zealand, 488,000 from the northern countries of Europe, and 423,000 from the Irish Free State. These figures place Glasgow sixth among the ports in the United Kingdom. The harbour works, which have proved a wonderful

means of trade, were created by means of capital derived from commerce, and it is to them that the Glasgow area owes its success in seizing the opportunities of industrial development (see Fig. 46).

The decisive factors in the industrial development of Glasgow and its district were its soil and its coal. Several outcrop coalfields occur in a belt of country 20 to 30 miles wide and stretching from the Ayrshire coast to the Forth. Two of the most important lie in the west, viz. the Ayrshire coalfield which runs along the shores of the Firth of Clyde from Ardrossan to the mouth of the Doon ; and the Lanarkshire coalfield which extends from the banks of the Clyde to the Forth. Together they yield two-thirds of the 30 or 35 million tons of coal raised annually in Scotland. The coal deposits in the western area have the remarkable peculiarity of interspersing beds of iron ore among the carboniferous strata. This combination of fuel and ore has caused the concentration of all the Scottish blast furnaces in the Glasgow district. The deposits of ore are now approaching exhaustion, but the great industrial plants to which they gave rise continue to flourish on imported ore. They do not consume all the coal raised, however, and the surplus is exported from Glasgow, Ardrossan, Irvine, Troon, and Ayr.

An enormous agglomeration of various industries has grown up on the coalfields of the Clyde near Glasgow. In contrast with other industrial regions in Britain, the district has the peculiarity of being unspecialised and of uniting in one huge group all the different types of industry. There is metallurgical production, as in Birmingham ; shipbuilding, as at Newcastle and Belfast ; cotton manufactures. as at Manchester ; and chemical industries, as at Liverpool.

All the conditions favoured the growth of metallurgical production. In 1801, Mushet discovered excellent blackband iron ore which could be smelted without limestone flux. Splint coal, which can be used without preparation for smelting ore, is found in the district. In 1828, Neilson invented a hot-air bellows which effected great economies in fuel, and James Watt made his first successful experiments with the steam engine in Glasgow. There are blast furnaces right in the suburbs of the town ; but most of them are farther east in the Calder valley at Motherwell, Wishaw, Newmains, Shotts, and Coatbridge. Scarcely any of the ore now comes from Scotland, most of it being imported from Spain. Some of the pig iron is exported to other metallurgical centres in Britain and abroad, shipments being sent even to the Far East. But most of it remains in the district to be made into steel and to feed the industries of Scotland, for all branches of iron manufacture are represented in and around Glasgow. There are locomotive works which employ more than 8000 hands at Springburn, Cowlairs, and Polmadie ;

engineering shops in which are made boilers, frames, bridges, and sheds : factories producing tubing and piping and machinery for sugar refineries ; motor-car works at Paisley, Scotstoun, and Bridgeton ; sewing-machine factories at Kilbowie ; machine-tool production at Johnstone and Paisley ; and the construction of pumps, cranes, and gear-wheels at Greenock and Paisley. Side by side with these factories are others which also work heavy material and use a great deal of coal, viz. glass and chemical works, potteries, and manure factories.

Shipbuilding, which was attracted to the banks of the Clyde by the cheapness of coal and iron, has won Glasgow a world-wide reputation. Its pre-eminence dates from the use of iron in the construction of ships, when the yards on the Thames and Mersey had to give way to those on the Clyde. From Glasgow to Greenock there is a double row of shipyards at Partick, Clydebank, Dalmuir, Kilpatrick, Bowling, and Dunbarton on the north bank and at Govan, Port Glasgow, and Greenock on the south bank. A trip down the river by boat runs between two lines of noisy, smoky yards, between gigantic scaffoldings, and great iron hulls ready for launching (see Plate LIVc). There is much specialisation in the yards, some building cargo-boats, others liners, warships, or sailing vessels, others machinery or dredgers. The giant liner *Queen Mary* was built here in 1936, and the even larger *Queen Elizabeth* was constructed in 1938. In 1871, 50 per cent. of the tonnage launched in the United Kingdom came from the Clyde yards, but in 1923 this had fallen to 28 per cent. The annual production rose from 242,000 tons in 1873–1883 to 423,000 in 1893–1902, to 504,000 in 1903–1912, and to 532,000 in 1913–1923. In 1923 it was 175,500 tons and in 1937 it was 336,900 tons. Most of the work was done for British owners, but foreign countries took a quarter or a fifth of the production.

In the 17th and 18th centuries weaving had been practised intensively on the domestic system in the rural districts of Scotland. The traditional experience and technical skill thus acquired rendered the introduction of cotton manufacture an easy matter towards the end of the 18th century. Before the world crisis of 1931 this industry employed 50,000 people in Lanarkshire, Ayrshire, and Renfrewshire. Paisley is the world's largest centre for the production of sewing-cotton. In and about Kilmarnock are curtain and guipure lace factories, whilst near Dunbarton are large dye works. Silk itself, that finest of textiles, has found a place in Lanarkshire, where in 1936 it gave a livelihood to nearly 3000 people.

Before Glasgow had become a great port serving a huge manufacturing district, it stood on some high ground on the right bank

of the Clyde, on a group of drumlins, or rounded knolls of glacial clay, which overlooked the little valleys and depressions of the surrounding country. Today this site is occupied by only the northeastern quarters of the city, where the old cathedral rises on an isolated hill (see Fig. 46). The town has spread out westwards on both banks of the river. In 1707 its population was only 13,000 ; but this increased to 43,000 in 1780, to 77,000 by 1801, to 345,000 in 1851, to 761,000 in 1901, and to 1,088,000 by 1931. Hence, Glasgow is the second largest town in the British Isles. In the course of its rapid expansion the town has covered all the ground near the river. Though it has a greater population than Liverpool, it occupies a far smaller area. Consequently, in the heart of the city there are masses of people still living in slums. In 1866, more than 50,000 persons were crammed into a space of 92 acres. But new streets have been made, the old quarters opened up, and better houses built. Gradually, the sordid 'rookeries' are disappearing. In the south, on the left bank of the Clyde, huge quarters of the town form a kind of 'Southwark.' But expansion, especially since 1870, has been greatest in the west, where there are splendid residential areas, together with Kelvingrove Park and the Botanical Gardens. Here, too, are the University buildings, which were erected between 1866 and 1870.

The great city influences the whole of the surrounding region, for its business men, merchants, and industrialists, whether by their example or by their own actions, have caused the same kinds of work to spread over the neighbourhood. A vast nebula of satellite towns is associated more or less with its life and business. Towards the east these include the iron and coal towns of the Black Country : Airdrie (pop. 26,000), Coatbridge (pop. 43,000), Wishaw and Motherwell (combined pop. 65,000), Hamilton (pop. 37,800), and a whole swarm of new towns which sprang up during the second half of the 19th century, viz. Bellshill, Uddingston, Mossend, Holytown, Newarthill, and Larkhall. In the southwest there are Paisley, which increased its population from 17,000 in 1801 to 86,000 in 1931; Kilmarnock, which grew from 8,000 to 38,000 in the same period ; Ayr, which similarly rose from a population of 5000 to one of 37,000 ; and various little industrial centres have grown up at Muirkirk, Dalry, Dalmellington, and Ardrossan. In the northeast Glasgow's influence reaches the Forth, where Grangemouth may be regarded as its outport on that river. Downstream on the Clyde is a succession of towns working for and with the great seaport. These comprise the old county town of Renfrew (pop. 15,000) and the shipbuilding towns of Clydebank (pop. 47,000), Kilpatrick, Port Glasgow, Dunbarton, and, lastly, Greenock, whose



[Photo: M. N. R. Jackson.

A. LOCH LOMOND

Ben Lomond appears in the background, and on the near side of it are indistinctly seen some rocky islands which have been rounded by glacial action.



[Photo: Aerofilms.

B. SHIPYARDS ON CLYDESIDE

Messrs. John Brown & Co.'s yard at Clydebank. The large ship is the Cunard-White Star liner *Queen Elizabeth*.

[To face page 174.



[Photo. Valentine.]

A. THE SOUTHERN UPLANDS OF SCOTLAND

The photograph shows the confluence of the Tweed and Ettrick near Selkirk. Between the two rivers stands Sunderland Hall with its fine park. The countryside is lightly wooded, and is divided between agriculture and pasturage. The hills in the background are used as sheep-walks.



[Photo: Mitchell.]

B. GLENKENS DISTRICT IN GALLOWAY

This is a fertile valley in the west of the Southern Uplands. The village stands on a ridge which rises above the damp valley-bottom. The hills are used for grazing.

the Don reaches the sea, and so it commands two valleys which run far back into the Grampians. The rapid growth of the town in modern times dates from the construction of its two wet docks which give a safe haven to trading and fishing vessels and enable them to berth and sail regularly. More than 250 steam trawlers from

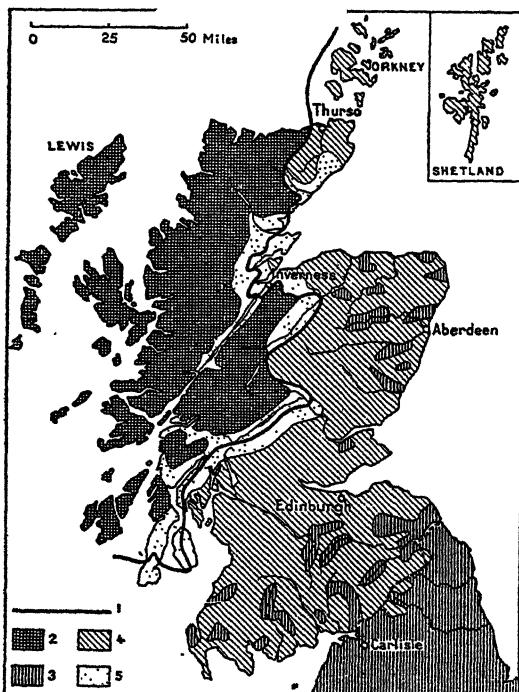


FIG. 42. Distribution of the Gaelic Language in Scotland. (After Bosse.)

1. Eastern limit of the area in which more than 50 per cent. of the population habitually use the Gaelic tongue or can speak it.
2. Areas in which 75 per cent. of the population speak Gaelic.
3. Areas in which English only is spoken.
4. Areas in which 75 per cent. of the population normally speak English.
5. Areas in which the two tongues are nearly evenly distributed.

Aberdeen frequent the Great Fisher Bank. Besides the preparation of smoked and salted herrings and cod (see Plate XIII), which is the traditional form of treating fish in Scotland, Aberdeen deals in fresh fish, distributing it by means of express trains to the towns in the south. One-third of the fish caught in Scottish boats is landed at Aberdeen. The town is run by fish merchants and others connected with the trade, and fish is the main source of work and livelihood.

Smoked herrings, whether kippers or bloaters, are despatched in boxes ; salted herrings are packed in barrels ; smoked haddock is prepared for the English breakfast table ; and the more dainty fish is transported in ice. Aberdeen ranks with Hull, Grimsby, Yarmouth, and Lowestoft among the chief fishing centres on the east coast of Britain. The great town is responsible for the close connexion of the Highlands with the general life of the North Sea.

Rising behind the east coast, whose gates open on to the main highways of the sea, the Highlands are still rather isolated and seem proof against outside influences. Waves of foreign invasion have dashed against them without effect. They are the last stronghold of Gaelic, since according to the census of 1931 there were 7069 persons who spoke Gaelic only, whilst 137,149 others spoke both English and Gaelic (see Fig. 42). Up to the 18th century the Highlanders kept their ancient customs, their organisation in clans distinguished by their tartans and their war-cries ; and they still continued their feuds and tribal quarrels. Highlanders of those days are described as a race of raiding and plundering herdsmen who were a terror to the 'bread eaters' of the Lowlands, and whose adjacent landlords were wont to pay a kind of tribute known as 'blackmail' to the chiefs of the clans. The old pastoral habits were replaced by modern sheep farming in the 19th century, when the country was invaded by swarms of noisy trippers, by shooting parties, and by the railways. The change took place slowly, for natural peculiarities helped the strength of tradition to check the new ways of life. There were no roads in Sutherland before the 19th century, and until 1811 Dornoch and Oykell Firths could only be crossed by ferry. The Caledonian Canal, constructed by means of twenty-eight locks through Glen More between 1804 and 1822, has never been of more than local use, though it was intended as a main highway between the two seas. The Highland Railway was not opened until 1863 and reached Thurso only in 1874. The east-to-west railways are more recent, that to Strome Ferry (Lochalsh) having been built in 1870, that to Oban in 1880, and that to Mallaig in 1901. These changes have by no means effaced the rugged peculiarities of the Highlands. In their desolate moors and among the cottages, with their smoke-grimed dry-walls and their roofs of turf or reed-thatch, it is still possible to breathe a calm and healthy old-world atmosphere.

2. THE MIDLAND VALLEY

Between the ancient massifs of the Highlands and Southern Uplands lies an uneven plain running southwest-to-northeast with the general grain of the land (see Fig. 43). As the estuaries penetrate

far inland here, the plain is very narrow, occupying scarcely one-fourth of the surface of Scotland. But this slip of land, the Midland Valley, has been for centuries the centre of Scottish life, owing to the

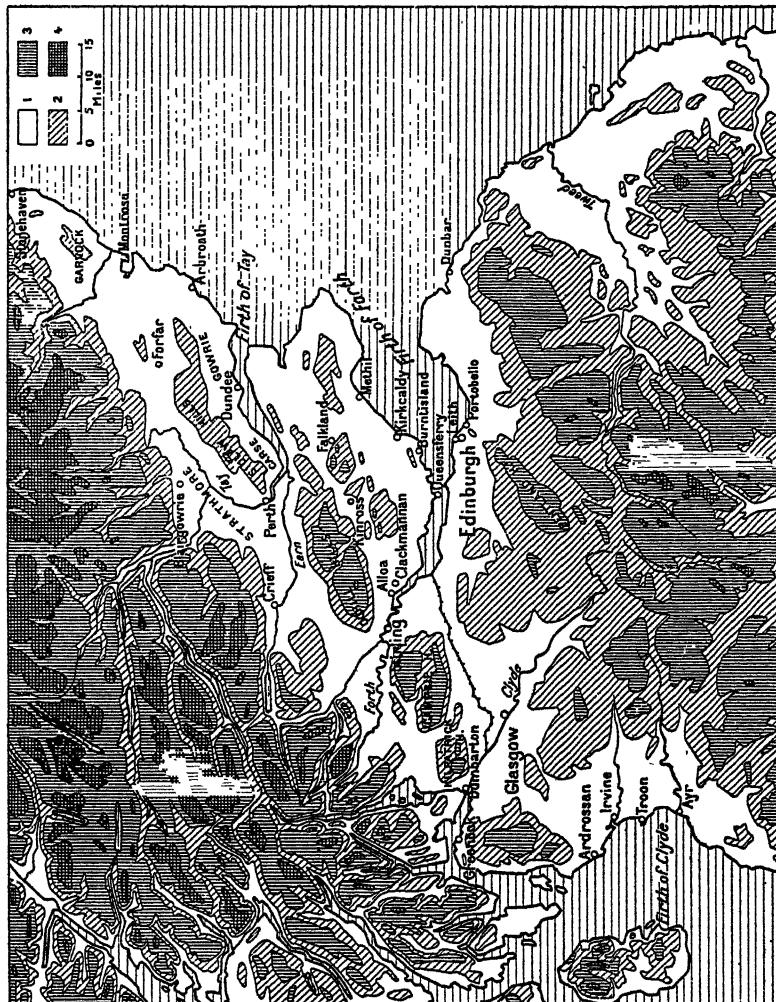


FIG. 43. Relief of the Midland Valley.
 1. Less than 500 feet above O.D.
 2. Between 500 and 1000 feet.
 3. Between 1000 and 2000 feet.
 4. Exceeding 2000 feet.

fertility of its valleys, its contact with the sea, its mineral wealth, and its ease of communication. Two-thirds of the population of Scotland are crowded into it, and it contains the second largest town in the British Isles, viz. Glasgow, with more than a million inhabitants.

THE COUNTRYSIDE IN ITS NATURAL AND CULTIVATED ASPECTS.

The Midland Valley is a rift bounded on the north and south by almost rectilinear faults. The mighty trench is floored with Devonian and Carboniferous rocks, consisting of red sandstone, shales, coal measures, clays, limestones, and various other rocks, among which are intrusions of resistant masses of eruptive material. The relief is wholly due to the occurrence of these different rocks side by side. Relatively soft sediments have yielded hollows and local plains, whilst the outcrops of eruptive rocks stand out as hills, ridges, and escarpments which have had a predominating influence on the details of the relief. They form two lines of hills in the midst of the Valley. The more northerly runs northeast-to-southwest and includes the Garvock, Sidlaw, Ochill, Campsie, and Kilpatrick Hills, together with the heights lying between Greenock and Ardrossan. The more southerly comprises the Garleton and Pentland Hills and the heights rising to the southwest of the Clyde valley. Between the two lines rise many isolated hillocks which are outcrops of eruptive rock and which give variety, abruptness, and irregularity to the scenery. Sometimes they form lines of flat-topped elevations like the Bathgate Hills, the Salisbury Crags, and the Lomonds of Fife; at other times they are rocky crags which rise abruptly from the plain to form the curious hills of Fife (including the Binn of Burntisland, the Hill of Beath, and Tor Hill) and the three volcanic necks of Traprain Law, North Berwick Law (see Plate VI A), and the Bass Rock. In some cases they give rise to precipitous rocks which have been used as sites for splendid castles like those of Edinburgh, Dunbarton, and Stirling (see Plate XXIV B).

In fact, the Midland Valley is by no means a plain, for high ground meets the eye in all directions. Like certain districts in Ireland and the Welsh Marches, they consist rather of a network of hollows and valleys winding between high ground. Below the 900-foot contour, the depressions contain good alluvial soil which has given the country its agricultural wealth. The Forth valley is proverbial for its fertility. As the saying goes, 'Better a link of Forth than the province of Moray.' The Midland Valley has always been a rich area.

The scenery of the agricultural portions of the Valley is the work of man. The spirit of progress, which had its origin in English industrialism, found adepts among the great landowners, and by the end of the 18th century common land had begun to disappear and the system of enclosures to become general. There came into being a class of farmer whose holding comprised on the average some 150 to 200 acres and was held on a very long lease. The landowners helped to improve agriculture by draining swamps and, after 1720,

by introducing the use of clover and artificial fodder crops. Wheat took its place in the rotation of crops along with the traditional oats and barley. Historical documents record as a sensational event the sowing of a seven-acre field with wheat near Edinburgh in 1727. In recent times Scottish agriculturalists have quickly reacted to the fall in the price of corn in the world market and have turned towards pastoral production.

The eastern portion of the Valley is famous for its fertility, especially Strathmore, the plains of Fife and Forfar with the Carse o' Gowrie, and, on the south bank of the Forth, the district around Edinburgh and the Lothians generally. Fields of oats, barley, turnips, potatoes, clover, and lucerne cover a greater area in Forfar and Fife than in any other part of the country. Since the climate is relatively dry, farms occupy slopes up to the 1250-foot contour. The fattening of sheep on turnips, the cultivation of new potatoes, and the breeding of milch cows are among the most paying enterprises. At the foot of the Sidlaw Hills from Perth to Dundee stretch the fertile acres of the Carse o' Gowrie. The land is here divided into large fields surrounded by hedges and trees. They either carry cereals or greens and artificial fodder crops; or they are under hay and are dotted with haystacks; or else they are under grass on which stock is being fattened. In the orchards that grow around the homesteads apple, pear, plum, and cherry trees spread out their leafy foliage, under which flourish thick growths of gooseberries and raspberries. The Carse is the golden girdle of the banks of the Tay. Farther north from Stonehaven to Perth cultivation is equally vigorous in Strathmore. But it is even more so in the Lothians, where modern agriculture first took root. There wheat and barley give greater yields than in any other part of Britain; Dunbar potatoes, nurseries of trees and shrubs, and flower gardens offer abundant returns. The density of town population encourages agricultural production, and barren soils are improved and brought under cultivation. Between Leith and Portobello large sandy areas in the Craigentinny moors have, through the use of sewage from Edinburgh, been turned into fat grazing land for feeding milch cows and also oxen destined for the slaughter-house. As elsewhere throughout Britain, the richness of the soil dates from the time when land was pressed into the service of the large towns and industrial centres.

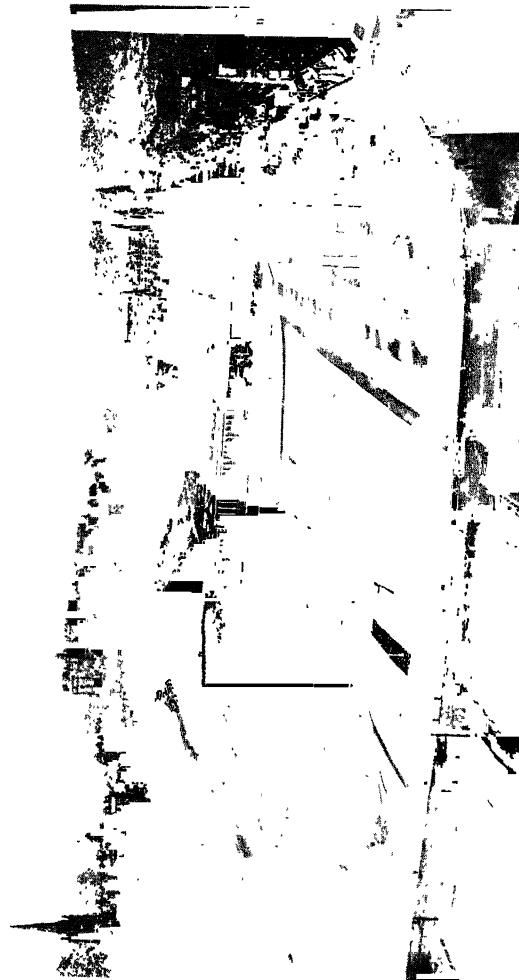
TOWN LIFE IN THE FORTH AND TAY DISTRICTS. The large number of little towns in the east of the Midland Valley points to the wealth and long-established geographical advantages which exist here. Where valleys enter the plain along the line of contact between the Highlands and Lowlands there is a row of market towns and villages, including Crieff, Dunkeld, Blairgowrie, and

Stonehaven, where Highlanders and Lowlanders have been wont to mingle for long ages. Another series of towns, including Forfar, Kinross, Clackmannan, and St. Andrews, are scattered among the straths and fertile plains, where they act as agricultural centres. Stirling and Perth owe their greater prominence to their geographical positions. Each of them stands on a river at a point where the stream issues from a gorge in the Sidlaws or Ochills and is bridged at the head of its tidal estuary. Moreover, they both guard a historic route to the Highlands. Stirling (pop. 22,600) stands on a river terrace on the right bank of the Forth and is commanded by a volcanic neck on which its ancient castle was built. The part it formerly played as a bridgehead survives today in its function as a railway junction. Perth (pop. 34,800), which stands on a terrace above the Tay, guards another route. It was once a Roman station, then the residence of the Scottish kings; but, though it was a busy port in the Middle Ages, it would be an unimportant town today but for its linen and jute mills.

Towns occur most frequently on the coast and more especially along the Forth. The estuary of this river may be said to be bordered with coalfields. On the south bank lies the Lothian field, whose forty-six seams give a total thickness of nearly 130 feet of coal. The outcrop is interrupted by the Forth, but reappears on the north bank in the Fifeshire coalfield. Farther west at the head of the estuary and on its northern bank is the Clackmannan coalfield, which passes under the river to join the big Lanarkshire field. Coal is mined both under the river bed and on the banks. The little island of Preston opposite Bo'ness contains a mineshaft. At Bridgeness coal is mined 400 to 500 feet under the river beneath a thick layer of clay which forms the impermeable bed of the Forth. The coal has been worked in the district since the 13th century. The abundance of fuel led to the establishment in 1760 of the large Carron Ironworks on the banks of the Carron not far from Falkirk. Now that the ironworks have migrated to the Glasgow district, large quantities of coal are available for export from the Forth. Hence, this fuel is shipped from all the ports on the estuary, including Leith, Burntisland, Methil, Alloa, Bridgeness, Bo'ness, and Grangemouth. The annual quantity before 1939 amounted to nine million tons. These towns are all growing apace. Between 1850 and the present day Grangemouth has increased its population from 2000 to 11,800, and Bo'ness from 1800 to 10,000.

One of the two important oilfields in Britain is worked in Linlithgow and Midlothian on the south bank of the Forth. In 1934, the quantity of oil distilled from carboniferous shales amounted to 64,000,000 gallons; in 1945 it had risen to 119,000,000 gallons. It is

PLATE XXV



[Photo: Valentine.

EDINBURGH

In the centre of the photograph is the valley through which the railway runs. Behind it is Castle Rock, the original site of the town. On the right is Princes Street, the main thoroughfare of the city, with Scott's monument.

PLATE XXVI



[Photo: Valentine.]

A. FISHERMEN'S HUTS AND BOATS AT BARRA IN THE HEBRIDES
The photograph shows a sheltered sound ; the bare, treeless country ; and
the fishermen's huts built with dry walls and thatched with reeds.



[Photo: Valentine.]

B. STORNOWAY
A little fishing port on Harris in the Outer Hebrides. The surrounding country
is ice-planed and pierced by numerous inlets of the sea.

used mainly for lighting. The two little counties containing the wells and refineries have increased their population by 400 per cent. since the beginning of the 19th century.

The production of linen, jute, and coarse cloths, which is centred on the banks of the Firth of Tay in Forfar and Fifeshire, is an industry of long standing. The towns connected with it line the coast from Dundee to the Forth. Dunfermline (pop. 35,000) produces best quality cloths and damasks ; Kirkcaldy (pop. 44,000) manufactures oilcloth and linoleum. The bleaching and dye works at Perth are connected with the group. Farther north Arbroath and Montrose turn out coarser cloth. But the centre of linen and jute manufacture is Dundee, which sprawls out along the north bank of the Tay. For long it was mainly a fishing port, taking part in whale-fishery and doing some shipbuilding ; but now it has only a few whaling vessels, though its trawlers still operate on the grounds near Bell Rock. Its textile industry has supplanted all others and practically concentrates in the town and its immediate neighbourhood the whole of the linen, hemp, and jute manufactures of Britain. Its factories produce coarse cloths, sacking, canvas, and carpets and employ 35,000 hands. Up to 1880 Dundee had no competitor ; but Calcutta and other towns have invaded its monopoly. Hence, it is daily tending more and more towards the manufacture of ropes and hawsers and towards the production of yarn which is sent abroad to be woven. Nevertheless, the treatment of fibres remains the principal activity of the town and its port, raw materials for textiles forming more than four-fifths of the value of the imported goods, and textile products bearing the same proportion to the total exports. As raw jute arrives during five months only, the docks have had to be enlarged several times. Owing to the proximity of the fruit-growing Carse o' Gowrie, jam-making has sprung up in Dundee and has assumed huge dimensions. It ranges from the production of jam from local fruit to that of marmalade from imported oranges. Hence, sugar figures largely among the imports. The convenience of well-appointed docks have attracted other industries, such as engineering works for the production of machinery for the jute industry the world over, as well as shipyards, sawmills, and papermills. Owing to its development into a great industrial town, Dundee has increased its population enormously. The number of its inhabitants rose from 21,000 in 1801 to 61,000 in 1851 and 175,000 in 1931.

EDINBURGH. Geographical causes placed the capital of Scotland near the Forth. The fertile lowlands which border the Forth and Tay afford a natural route from north to south for both trade and war. In the past, successive capitals have been established along this

route at Perth, Stirling, Dunfermline, and Edinburgh, to hold the line of communications. Modern engineering has strengthened its importance even more. At Queensferry, where the Forth narrows, the Forth Bridge was built in 1890 to avoid the roundabout way through Stirling and to take the railway from Edinburgh to Perth and Dundee (see Plate LVA). Farther north another great viaduct

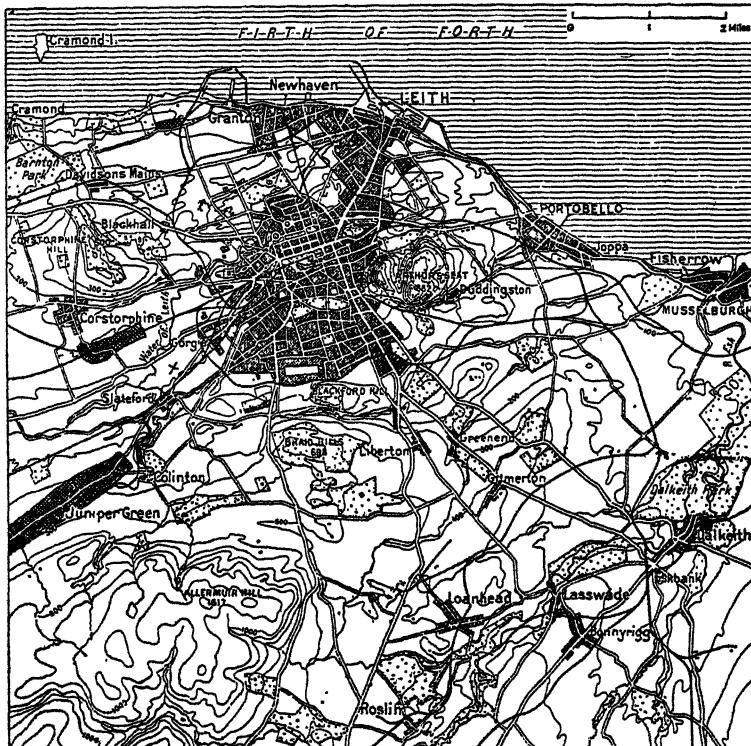


FIG. 44. Edinburgh and its Neighbourhood. Heights in feet.

nearly two miles long crosses the Tay near Dundee, thus shortening still more the distance between Edinburgh and the north.

Edinburgh stands in a splendid position on this historic highway at a point where the belt of lowland narrows between the Pentland Hills and the shores of the Forth. It is built on volcanic necks which stand up abruptly from the plain. The first to be occupied were Castle Rock and Calton Hill. Later, the growth of the town gradually spread round Arthur's Seat on the east, Corstorphine Hill on the west, and Blackford Hill on the south (see Fig. 45). Castle

Rock, the smallest and lowest of these necks, though not the least easy to defend, determined the site of the original fortress and, like the Acropolis at Athens, became the nucleus of the town. Taken and retaken again and again by English and Scots, it remained

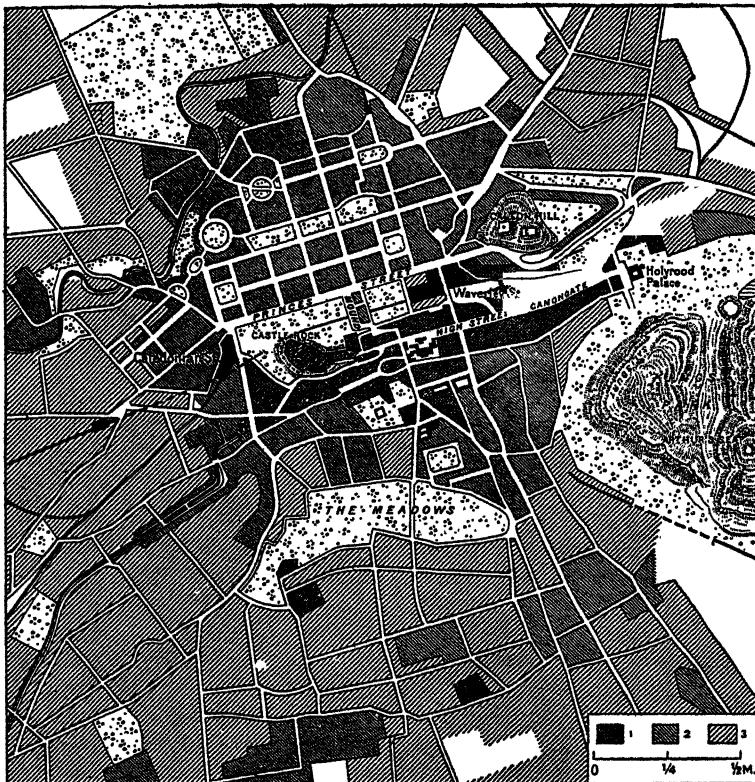


FIG. 45. Growth of Edinburgh.

1. The City in 1750.
2. Additions between 1750 and 1840.
3. Development since 1840.

finally in Scottish hands after 1341, and in the middle of the 15th century it replaced Perth as the capital of Scotland.

The Castle stands on the western slope of the Rock, while at the eastern end is Holyrood Abbey, founded in 1218 by David I. Near the latter is the royal palace. Between the Castle and the Abbey the town grew up along the connecting highway, which is now known as High Street and Canongate. The houses are tightly packed

within these precincts. As population increased, the town could not expand in area ; so it grew in height. This oldest portion of Edinburgh is still marked by closely built, lofty houses, narrow blind alleys, winding streets, and all that picturesque, though filthy, disorder which modern hygiene will soon dispose of. Up to the end of the 18th century the town spread southwards, gradually covering all the slopes of Castle Rock and even overflowing on to the level ground near the foot of the hill. All the historic monuments and public buildings of the capital, including the Castle, the Houses of Parliament, the Law Courts, the Cathedral of St. Giles, the University, and some museums, lie within the city as it was at the end of the 18th century.

In this period of economic development and prosperity new quarters were built on a methodical plan and formed as it were a second town to the north of the old city on a rise running parallel with Castle Rock and separated from it by a ravine. This new part of the city is classical in style and is regularly and spaciously laid out with straight streets and large squares. The main thoroughfare of the modern town and the busiest in the whole city is Princes Street, a wide highway with hotels, clubs, and smart shops along it. Overlooking the ravine, whose bottom is laid out in beautiful gardens, it commands a picturesque view of the old Castle. At each end of the ravine issues the railway from two huge stations, the Waverley and the Princes Street, or 'Caledonian.' The ravine is crossed by two bridges and a viaduct known as the Mound, which join the old town on one hill to the new town on the other. The hills, gardens, trees, majestic monuments, and distant picturesque views give these two parts of central Edinburgh a peculiar charm which is felt in no other city in Britain (see Plate XXV).

Today, both the ancient and the 18th century towns have been swallowed up in 19th century accretions which have made Edinburgh into a typical modern conurbation, sprawling out in all directions. The population has grown from 38,000 in 1801 to 194,000 in 1851, and 439,000 in 1931. The last figure includes Leith, the port of Edinburgh, which is situated just over two miles from the capital. The villages and little towns in the immediate neighbourhood have all become suburbs, and there are summer and seaside resorts at Musselburgh, Portobello, Newhaven, and Granton.

Since as far back as the Middle Ages, Leith has been little more than the port and an industrial satellite of Edinburgh, and its shipping trade has grown with the development of the city. Its functions are faithfully reflected in the nature of the goods which pass through it, for it imports cereals, flour, butter, cheese, eggs, sugar, and other foodstuffs needed by a great urban centre, while its

exports are of no great importance. But for machinery and textiles produced in Glasgow and shipped to the Continent from Leith, there would be no exports except the coal, mineral oil, and sulphate of ammonia from the immediate backland. Shipping facilities have given rise to refineries, rope factories, cloth mills, soap factories, distilleries, and flour mills, nearly all of which supply local needs.

Edinburgh is hardly more an industrial city than it is a seaport, and the city is in some respects unique among the great British towns. In Britain, where centralisation has not proceeded as far as it has in France and other countries, the various national temperaments have not been fused in a common mould. Consequently, Edinburgh remains a purely Scottish capital. It engages in few occupations which do not arise from this function. Its printing-works and publishing firms with their ancillary crafts and manufactures, such as paper and ink, are activities proper to a city which is the intellectual, scientific and legal headquarters of the country. Its great University is famous for its medical faculty and has a fine library, and its learned societies, including the Royal Society of Edinburgh and the Royal Scottish Geographical Society, are of world-wide reputation. Its geographical researches and investigations rest on a foundation laid by great scholars like Sir John Murray, the oceanographer and limnologist, Sir Archibald Geikie the geologist, and Bartholomew the cartographer. The ancient city is very wealthy, and its banking and insurance houses are larger and more numerous than those of Glasgow. Edinburgh rises very far above the status of a provincial or regional capital and is a real metropolis, a capital city by tradition as well as by intellectual and cultural influence.

GLASGOW. In the west of the Midland Plain there has grown up around Glasgow a centre of world-commerce with a swarming population and an immense industrial activity. Yet these conditions do not go far back into the past, since geographical conditions were for long unfavourable. The damp, foggy climate makes the cultivation of cereals difficult and uncertain ; before the engineering works undertaken in the 18th century the Clyde was only a small stream of difficult navigation ; and the district was tucked away in the north and lay opposite unfrequented lochs and sounds. In such poor and isolated surroundings Glasgow long played the modest part of an episcopal see whose diocese extended over barren mountains and of a marketing centre for the islands scattered over a fogbound sea. Its population, which hardly reached 4500 in 1556, numbered only 14,000 in 1661.

The growth of the town dates from the union of England and

Scotland and the consequent opening of trade with the English colonies. Shipping firms and mercantile houses were at once established for this trade. By 1760, Glasgow's tobacco trade exceeded Bristol's; in 1775 the town imported half the tobacco consumed in Europe; and it had become the chief European centre for this profitable commodity. A great change came over the place. It began to spread from the neighbourhood of the cathedral, where the old streets bore the names of saints and crafts, to the riverside, where the trade in tobacco, sugar, rum, and cotton gave new street-names like Jamaica Street, India Street, and Havana Street. Colossal fortunes were amassed and with them the means of constructing a great modern port on the Clyde (see Plate XXVII B).

Even in the middle of the 18th century, when Glasgow was rising to the status of a great colonial *entrepot*, the town was not a large port. Many ships could not sail upstream as far as Glasgow and ocean traffic nearly always stopped 18 miles below the town at Port Glasgow, an outport constructed as early as the end of the 18th century. From this point goods were taken overland to Glasgow. The construction of a fairway to Glasgow was necessary for the safety of the overseas trade. At high tide the Clyde was merely a wide sheet of water covering marshy banks, whilst at low tide it was a little stream full of sandbanks and with a depth of only 15 inches in one place. It could be forded 21 miles below the town. The plan for improving the river by constructing embankments to contain the stream and force it to sweep its own bed and for deepening the channel by dredging was proposed in 1773 by Colborne, a famous Scottish engineer. The colossal undertaking, which was begun with primitive dredgers and continued ceaselessly for more than a century with increasingly improved equipment, has turned the Clyde between Glasgow and Port Glasgow into almost as artificial a waterway as the Suez Canal. The maximum draught was raised from $12\frac{1}{2}$ feet in 1821 to 18 feet in 1851, to 23 feet in 1891, and $26\frac{1}{2}$ feet in 1900. At the present day the channel is 25 feet deep at low water and 35 at high tide. Until lately, big ships required two tides for the passage, but now they can leave Glasgow two hours before high water, when the river is 30 feet deep, and reach Greenock in a single tide, either by day or by night, for the fairway is well marked with navigational lights. The docks, which are now accessible to large ocean-going vessels, stretch for $2\frac{1}{2}$ miles along the river bank. Up to 1867 shipping was confined to the Clyde itself, and the quays and wharves were built on the riverside; but, since the large number of shipyards left little room on the banks, it was decided to construct basins which communicated freely with the river and increased the space available for water traffic. Kingston

Dock was built in 1867, Queen's Dock in 1880, Prince's Dock in 1890, and Rothesay Dock in 1907. The tonnage of ships entering Glasgow from overseas in 1936 amounted to 4,705,000 tons, of which

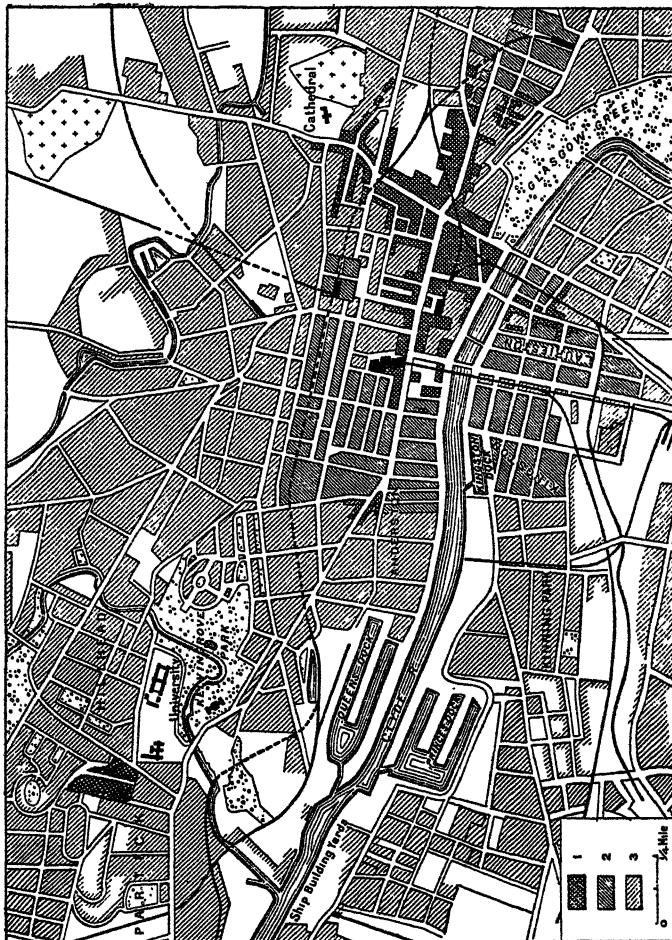


FIG. 46. Growth of Glasgow.
1. Glasgow in 1778. 2. In 1821. 3. Present development.

1,246,000 tons consisted of shipping from the United States and Canada, 509,000 from Australia and New Zealand, 488,000 from the northern countries of Europe, and 423,000 from the Irish Free State. These figures place Glasgow sixth among the ports in the United Kingdom. The harbour works, which have proved a wonderful

means of trade, were created by means of capital derived from commerce, and it is to them that the Glasgow area owes its success in seizing the opportunities of industrial development (see Fig. 46).

The decisive factors in the industrial development of Glasgow and its district were its soil and its coal. Several outcrop coalfields occur in a belt of country 20 to 30 miles wide and stretching from the Ayrshire coast to the Forth. Two of the most important lie in the west, viz. the Ayrshire coalfield which runs along the shores of the Firth of Clyde from Ardrossan to the mouth of the Doon ; and the Lanarkshire coalfield which extends from the banks of the Clyde to the Forth. Together they yield two-thirds of the 30 or 35 million tons of coal raised annually in Scotland. The coal deposits in the western area have the remarkable peculiarity of interspersing beds of iron ore among the carboniferous strata. This combination of fuel and ore has caused the concentration of all the Scottish blast furnaces in the Glasgow district. The deposits of ore are now approaching exhaustion, but the great industrial plants to which they gave rise continue to flourish on imported ore. They do not consume all the coal raised, however, and the surplus is exported from Glasgow, Ardrossan, Irvine, Troon, and Ayr.

An enormous agglomeration of various industries has grown up on the coalfields of the Clyde near Glasgow. In contrast with other industrial regions in Britain, the district has the peculiarity of being unspecialised and of uniting in one huge group all the different types of industry. There is metallurgical production, as in Birmingham ; shipbuilding, as at Newcastle and Belfast ; cotton manufactures, as at Manchester ; and chemical industries, as at Liverpool.

All the conditions favoured the growth of metallurgical production. In 1801, Mushet discovered excellent blackband iron ore which could be smelted without limestone flux. Splint coal, which can be used without preparation for smelting ore, is found in the district. In 1828, Neilson invented a hot-air bellows which effected great economies in fuel, and James Watt made his first successful experiments with the steam engine in Glasgow. There are blast furnaces right in the suburbs of the town ; but most of them are farther east in the Calder valley at Motherwell, Wishaw, Newmains, Shotts, and Coatbridge. Scarcely any of the ore now comes from Scotland, most of it being imported from Spain. Some of the pig iron is exported to other metallurgical centres in Britain and abroad, shipments being sent even to the Far East. But most of it remains in the district to be made into steel and to feed the industries of Scotland, for all branches of iron manufacture are represented in and around Glasgow. There are locomotive works which employ more than 8000 hands at Springburn, Cowlairs, and Polmadie ;

engineering shops in which are made boilers, frames, bridges, and sheds : factories producing tubing and piping and machinery for sugar refineries ; motor-car works at Paisley, Scotstoun, and Bridgeton ; sewing-machine factories at Kilbowie ; machine-tool production at Johnstone and Paisley ; and the construction of pumps, cranes, and gear-wheels at Greenock and Paisley. Side by side with these factories are others which also work heavy material and use a great deal of coal, viz. glass and chemical works, potteries, and manure factories.

Shipbuilding, which was attracted to the banks of the Clyde by the cheapness of coal and iron, has won Glasgow a world-wide reputation. Its pre-eminence dates from the use of iron in the construction of ships, when the yards on the Thames and Mersey had to give way to those on the Clyde. From Glasgow to Greenock there is a double row of shipyards at Partick, Clydebank, Dalmuir, Kilpatrick, Bowling, and Dunbarton on the north bank and at Govan, Port Glasgow, and Greenock on the south bank. A trip down the river by boat runs between two lines of noisy, smoky yards, between gigantic scaffoldings, and great iron hulls ready for launching (see Plate LIVc). There is much specialisation in the yards, some building cargo-boats, others liners, warships, or sailing vessels, others machinery or dredgers. The giant liner *Queen Mary* was built here in 1936, and the even larger *Queen Elizabeth* was constructed in 1938. In 1871, 50 per cent. of the tonnage launched in the United Kingdom came from the Clyde yards, but in 1923 this had fallen to 28 per cent. The annual production rose from 242,000 tons in 1873–1883 to 423,000 in 1893–1902, to 504,000 in 1903–1912, and to 532,000 in 1913–1923. In 1923 it was 175,500 tons and in 1937 it was 336,900 tons. Most of the work was done for British owners, but foreign countries took a quarter or a fifth of the production.

In the 17th and 18th centuries weaving had been practised intensively on the domestic system in the rural districts of Scotland. The traditional experience and technical skill thus acquired rendered the introduction of cotton manufacture an easy matter towards the end of the 18th century. Before the world crisis of 1931 this industry employed 50,000 people in Lanarkshire, Ayrshire, and Renfrewshire. Paisley is the world's largest centre for the production of sewing-cotton. In and about Kilmarnock are curtain and guipure lace factories, whilst near Dunbarton are large dye works. Silk itself, that finest of textiles, has found a place in Lanarkshire, where in 1936 it gave a livelihood to nearly 3000 people.

Before Glasgow had become a great port serving a huge manufacturing district, it stood on some high ground on the right bank

of the Clyde, on a group of drumlins, or rounded knolls of glacial clay, which overlooked the little valleys and depressions of the surrounding country. Today this site is occupied by only the northeastern quarters of the city, where the old cathedral rises on an isolated hill (see Fig. 46). The town has spread out westwards on both banks of the river. In 1707 its population was only 13,000 ; but this increased to 43,000 in 1780, to 77,000 by 1801, to 345,000 in 1851, to 761,000 in 1901, and to 1,088,000 by 1931. Hence, Glasgow is the second largest town in the British Isles. In the course of its rapid expansion the town has covered all the ground near the river. Though it has a greater population than Liverpool, it occupies a far smaller area. Consequently, in the heart of the city there are masses of people still living in slums. In 1866, more than 50,000 persons were cramped into a space of 92 acres. But new streets have been made, the old quarters opened up, and better houses built. Gradually, the sordid 'rookeries' are disappearing. In the south, on the left bank of the Clyde, huge quarters of the town form a kind of 'Southwark.' But expansion, especially since 1870, has been greatest in the west, where there are splendid residential areas, together with Kelvingrove Park and the Botanical Gardens. Here, too, are the University buildings, which were erected between 1866 and 1870.

The great city influences the whole of the surrounding region, for its business men, merchants, and industrialists, whether by their example or by their own actions, have caused the same kinds of work to spread over the neighbourhood. A vast nebula of satellite towns is associated more or less with its life and business. Towards the east these include the iron and coal towns of the Black Country : Airdrie (pop. 26,000), Coatbridge (pop. 43,000), Wishaw and Motherwell (combined pop. 65,000), Hamilton (pop. 37,800), and a whole swarm of new towns which sprang up during the second half of the 19th century, viz. Bellshill, Uddingston, Mossend, Holytown, Newarthill, and Larkhall. In the southwest there are Paisley, which increased its population from 17,000 in 1801 to 86,000 in 1931 ; Kilmarnock, which grew from 8,000 to 38,000 in the same period ; Ayr, which similarly rose from a population of 5000 to one of 37,000 ; and various little industrial centres have grown up at Muirkirk, Dalry, Dalmellington, and Ardrossan. In the northeast Glasgow's influence reaches the Forth, where Grangemouth may be regarded as its outport on that river. Downstream on the Clyde is a succession of towns working for and with the great seaport. These comprise the old county town of Renfrew (pop. 15,000) and the shipbuilding towns of Clydebank (pop. 47,000), Kilpatrick, Port Glasgow, Dunbarton, and, lastly, Greenock, whose

PLATE XXVII



[Photo: M. N. R. Jackson.

A. LOCH LOMOND

Ben Lomond appears in the background, and on the near side of it are indistinctly seen some rocky islands which have been rounded by glacial action.



[Photo: Aerofilms.

B. SHIPYARDS ON CLYDESIDE

Messrs. John Brown & Co.'s yard at Clydebank. The large ship is the Cunard-White Star liner *Queen Elizabeth*.

[To face page 174.

PLATE XXVIII



[Photo. Valentine.

A. THE SOUTHERN UPLANDS OF SCOTLAND

The photograph shows the confluence of the Tweed and Ettrick near Selkirk. Between the two rivers stands Sunderland Hall with its fine park. The countryside is lightly wooded, and is divided between agriculture and pasturage. The hills in the background are used as sheep-walks.



[Photo: Mitchell.

B. GLENKENS DISTRICT IN GALLOWAY

This is a fertile valley in the west of the Southern Uplands. The village stands on a ridge which rises above the damp valley-bottom. The hills are used for grazing.

destinies have long since been bound up with those of Glasgow. In 1716, Greenock was a mere village, but by 1801 it had a population of 17,000, and this had risen to 79,000 in 1931. Before the improvements in the port of Glasgow, Greenock acted as an outport at which colonial produce was landed, and it still keeps its large sugar refineries. Its shipyards give it a share in the industrial activities of the Clyde. Other and more distant towns also feel the influence of Glasgow. Among these are the seaside resorts of Helensburgh, Rothesay, and Dunoon, and all the little ports on the firths and sounds, all the Highland villages which are invaded by its citizens in summer, all the rural districts which, like Girvan, have become market gardens for the conurbation. Not far away on the Ayrshire coast is Prestwick, where one of the airports of Great Britain has been established. Glasgow is one of the most typical of the demographic phenomena which have arisen through modern industrial development. The population of Lanarkshire rose from 100,000 in 1750 to 600,000 (1850), 1,340,000 (1901), and 1,586,000 (1931).

3. THE SOUTHERN UPLANDS

The third main division of Scotland consists of a belt of uplands situated between the Midland Valley and the Solway Firth, and is known as the Southern Uplands, a name which is of academic rather than popular usage. This division resembles the others in having a northeast-southwest grain. In the course of history the boundary between England and Scotland has been subject to great oscillation in the south of the region. In very early times it ran through the Tyne Gap, but pressure from the English side shifted it northwards to its present line, which over most of its course follows the ridge-line of the Cheviot Hills.

SCENERY. The foundational rocks consist of ancient Silurian shales which have undergone much folding and have given rise to broad plateau surfaces covered with scrubby moors of heather and peat. The highest points seldom rise above 1900 feet. Broad valleys, or 'dales,' penetrate between the plateaus. An examination of the topographical forms and grain indicates a distinction between the eastern and western portions of the region, which is even more marked than that noticed in the Highlands.

In the west most of the rivers, *e.g.*, the Annan, Nith, Dee, and Cree, run transversely to the structural lines of the Caledonian folds and flow from the northwest to southeast, following the general slope of the plateau, which slants down to the Solway Firth. They lie in depressions cut in soft rocks that have been protected from erosion here and there by the foundering of the ancient rocks. Annandale,

which affords a passage for the railway from Carlisle to Glasgow, coincides from Moffat downwards with an outcrop of breccia and red sandstone of the Permian and Triassic systems. Nithsdale, which is followed by the railway from Dumfries to Glasgow, is an erosional valley cut through rocks of the Carboniferous, Permian, and Triassic. Farther west the long depression occupied by Loch Ryan and Luce Bay and almost wholly submerged by the sea lies on sediments of the Carboniferous and Permian systems. The northwest-southeast orientation which is common to the valleys, depressions, and inlets is a distinctive feature of the western part of the Southern Uplands. The presence of large masses of Granite among the ancient shales gives the area a higher and more broken relief, which is in contrast to the more rounded outlines and flatter tops of the eastern portion of the region. These mountainous features are still more strongly marked wherever ancient glaciers have left their imprint, and glacial topography is peculiar to the western area. In the hills of Cairnsmore of Carsphairn, Cairnsmore of Fleet, and the Rhinns of Kells and the Merrick (2764 feet), the upper valleys end in wild, steep-sided rocky corries in which peaceful tarns lie among the screes. A little farther down they are filled with irregular morainic mounds. The hills in Carrick and Galloway were also centres of glaciation and are marked by the features found normally in the Highlands, namely slopes strewn with erratic blocks, rock basins occupied by lakelets, and bare, treeless surfaces exposed to the winds from the sea (see Plate XXVIII**B**).

In the east of the region the big valley of the Tweed forms the central channel of the drainage system. Its network of tributary valleys spreads over a wide area of soft rocks of Old Red Sandstone and carboniferous limestone surrounded by ancient schists. The large streams run southwest-northeast, not northwest-southeast as in the west, so that the plateau is here divided into two parts by the broad valley of the Tweed and comprises two upland masses, the Lammermuir and Cheviot Hills, whose ridges are aligned perpendicularly to the coast. But as glaciation has had little effect here, the relief is regular and smooth in outline, as is usual in much eroded uplands. In the Lammermuirs (1750 feet) the skylines are uniform, are broken by neither bosses nor precipitous slopes, and consist of moorland on which graze flocks of black-faced sheep. There is no very rugged ground, except along the deep valley-bottoms and on the coast, where the sea has cut majestic cliffs which correspond in height to the plateau. At St. Abb's Head they rise 550 feet in vertical walls which are broken by gullies and pierced by caves.

South of the Tweed stand the Cheviot Hills, which share in the same southwest-northeast grain. Formed of ancient schists, Old

Red Sandstone, granite, and more especially of resistant masses of old eruptive rocks, lava and tuff, they attain a height of 1815 feet in Carter Fell, 1964 feet in Peel Fell, and 2676 feet in the Cheviot. The last is a great mass of granite partly covered with peat. Long flat spurs clad in grass and peaty moorland run out southwards from these hills, but to the north the ground falls away more sharply, and the picturesque slopes are broken by the pretty green and wooded valleys of Edgerston Burn and Jed Water. The charm of the Cheviots is to be found in their peaceful, wide horizons, the seasonal colouring of the heather, and the green of the valleys through which glide limpid streams. No district in Scotland has inspired more poetry and romance, but perhaps this is mainly due to its historic memories and its martial ruins, for it occupies the Scottish Border, the age-long battlefield of the two peoples.

From the tops of the Cheviots and Lammermuirs the hills decrease in height towards the broad valleys leading to the Tweed, viz. those of the Adder, Leader, Gala, Yarrow, Ettrick, Teviot, and Kale. The landscapes in these lower districts resemble those of the Midland Plain. Isolated hills, crags of igneous rock, volcanic necks, or basaltic lava-flows crowning a foundation of sandstone, like Bonchester Hill, Rubers Law, Dunian, Penielheugh, and the Minto and Eildon Hills, crop up in all directions. Though shut in by high moorland and irregular in its relief, the Tweed valley represents with its friable, fertile soil the main centre of population in the Southern Uplands (see Plate XXVIIIA).

The Southern Uplands differ from the Highlands in being less isolated and more easily accessible. They have escaped the stagnation of life in a mountainous region, because they are close to fertile, well populated districts and are crossed by long depressions which are followed by roads and railways. Industrial and urban centres have sprung up mainly in the east, since here nature has been more hospitable to man. There are sixty-four persons to the square mile, whilst the density of population does not exceed twenty-six per square mile in the purely mountainous counties of the Highlands. But a distinction must be drawn between the wilder, more rugged, damper, less cultivated, and less densely peopled west and the more open, gentler, drier, and more fertile east.

ECONOMIC SYSTEM OF THE SOUTHERN UPLANDS. The western portion of the Southern Uplands forms a large peninsula between the Firth of Clyde and the Solway Firth. Heavy autumn rains, lack of sunshine, and a mild maritime climate which enables stock to remain out at pasture the whole year round—all these circumstances are unfavourable to the growth of cereals, but favour stock-raising. Little stock farms sheltered by oaks, beeches, elms,

and ash are scattered amid green wooded countryside throughout the plains and valleys up to a height of 600 feet. The farmer toils to produce meat and milk. Sometimes he fattens young cattle for the Liverpool market, at other times he keeps milch cows. In Wigtownshire and along the coast of Kirkcudbright the milk is collected by motor vans and taken to dairies situated on the main roads and railways. Here butter is made and pigs are fattened. Remoter districts, like the Rhinns and the Machars, specialise in cheese-making.

Above the 600-foot contour the landscape changes. Nature becomes poorer and shabbier: birches and conifers replace the oaks; bracken and foxgloves fill the rough patches on the rocky slopes; and vast heather moors intersected by dry walls form immense pasture lands. This is the region of hill sheep farms, the home of flocks of sheep. But, in spite of the wealth of pasture, an air of solitude reigns over the plateaus and high valleys. There are few inhabitants, the density of population falling to a mere eight or ten persons to the square mile in certain parts of Galloway, and there is a tendency for numbers to decrease owing to migration to the towns. There are no industries and little or no urban life. At relatively low altitudes, at which orchards and cornfields occur in the Alps, there are only desolate moors in this region. The two highest villages in Scotland—Leadhills (1475 feet) in Lanarkshire and Wanlockhead (1500 feet) in Dumfriesshire—occur here, and their existence is due only to their lead and silver mines. The population as a whole collects in the dales and on the coastal strips, where little country towns and villages are to be found. Among these are Dumfries (pop. 22,800) on the Nith, with tweed and other woollen manufactures, Kirkcudbright, and Wigton. The closeness of the Irish coast, which is only 22 miles away, has redeemed the extreme end of the district from solitude, for as long ago as 1834 a harbour and a wharf were built at Portpatrick and a regular service to Donaghadee established. But owing to its exposure to rough weather, Portpatrick is now only the landing-place of the telegraph cable to Ireland; and the ferryport is at Stranraer, which is well sheltered at the head of Loch Ryan. From this point steamers take two hours to cross to Larne, the ferryport of Belfast.

The eastern portion of the Southern Uplands is crossed by routes which from the earliest times have led from England into Scotland. This part of the region faces the North Sea and has more fertile lowlands and a less cloudy sky. Hence trade, industry, and urban settlement grew up quite early. Good arable and grass land exist in the valleys and on the low coastal strips. Below its junction with the Teviot, the Tweed waters the Merse, one of the most

fertile districts in Scotland. Near the coast fields of wheat, oats, barley, potatoes, and turnips, large and strongly built farm-houses, and pastures full of stock give evidence of the busy character of the district. The counties of Berwick and Roxburgh are practically the only ones on the Southern Uplands to produce wheat and barley. In Berwickshire two-thirds of the total area is under cultivation, a proportion unknown in the other counties. For centuries agriculture has formed the wealth of the district. Of the nine abbeys founded in Scotland by King David in the 12th century, four lie in the Tweed valley, viz. at Kelso, Dryburgh, Melrose, and Jedburgh. In the 13th century Berwick exported the produce of its backland to the Netherlands and was the chief seaport in Scotland.

Apart from the cultivated areas on the lower ground, the wealth of the eastern counties depends on the moorland pastures among the hills and on herds of sheep. The Cheviot breed has been well known from time immemorial. Moorland covers 70 per cent. of the total surface of Peebles-shire, 78 per cent. of that of Selkirkshire, and 51 per cent. of that of Roxburghshire. The number of sheep to the acre reaches amazing figures. In Roxburghshire there are 1360 to every 1000 acres, in Selkirkshire 1130, in Berwickshire 1358, and in Peebles 910. In the western counties, which are devoted to cattle, the density falls to 495 in Wigtown, 700 in Kirkcudbright, and 880 in Dumfries. The importance of sheep-raising in the eastern counties is due to the long-established woollen manufactures which have successfully held their own against competition from Yorkshire. The many swift-flowing streams used to supply the factories with power; when coal replaced water-power, the high quality of cheviot wool and the inherited skill of the workers enabled the traditional industry to survive in this hilly region. Many towns in the Tweed valley, including Peebles, Galashiels, Selkirk, Hawick, Jedburgh, Kelso, and Innerleithen, manufacture woollen cloth.

Coveted for its wealth and lying on a great north-south route, this part of southern Scotland was long the Border for whose possession the English and Scottish fought each other. Along the coast and between the Cheviots and the sea, the present boundary traces a salient which carries it northward to the Tweed, where it follows the river for 26 miles. Every market town and rural centre in the neighbourhood has played its part as a fortress or battlefield. Roxburgh, which is a mere village today, once occupied a defensive position at the junction of the Teviot and Tweed and had its own mint and three churches. It was not rebuilt after its destruction by the Scots in 1460, and the present village is some two miles from the old site. Selkirk (pop. 5700), which stands on a hill overlooking

Ettrick Water, was burnt by the English in the 16th century. Kelso (pop. 3850) was burnt several times during the Border wars. Jedburgh, which was one of the fortresses handed over to the English in the 12th century by the Treaty of Falaise, was a royal residence and was destroyed by the Scots in 1409. The Cistercian abbey founded at Melrose in the 12th century was more than once plundered by armed bands, but suffered particularly severely in 1322. Hawick (pop. 17,000) has outstripped its neighbours owing to its woollen manufactures. Peebles, which is built on a gravel terrace at the confluence of Eddleston Water with the upper Tweed, grew up around a strong castle. Woollen manufactures keep Galashiels (pop. 13,000) busy, and Gala Water, which runs through the town, is polluted by the waste from the mills.

Along the coast the towns on the historic route from England to Scotland are now quiet places, though they too have had a stormy past. Berwick (pop. 13,000), at the mouth of the Tweed, became attached to England in 1302, though in 1355–1356 and again in 1462–1482 the Scots were once more in possession. The walls which surround it are reminders of the struggle during which it fell into the hands of the two nations in turn, according to the issue of battle. Today it carries on salmon fisheries. The fortress of Dunbar underwent many sieges and witnessed great battles under its walls. Now it is engaged in herring fishery, an occupation common to all the Scottish towns on the North Sea coast.

CHAPTER VII

THE NORTH OF ENGLAND

BETWEEN Scotland and Wales the Irish Sea encroaches on the shores of Britain and forms an extensive gulf, in whose centre lies the Isle of Man. Here the sand-choked inlets of the Solway Firth and Morecambe Bay (see Plate XXXD) and the estuaries of the Ribble, Mersey, and Dee penetrate far inland. As on the North Sea coast the tide runs up the Humber to within 25 miles of the Pennine slopes, the narrowest part of England is to be found here. It has a breadth of 75 miles between the Humber and the Mersey and forms a kind of hilly isthmus fringed by strips of coastal lowland. Like those of the Southern Uplands of Scotland, the hills belong to the series of old mountain structures which occur in Western Europe. They are known as the Pennines, a name derived from an old Celtic root which appears also in the designations of the Apennines and the Pennine Alps.

The strip of lowland on the west coast is narrow and is interrupted by the old structural block of the mountains of Cumberland. In Lancashire or Cheshire it is crossed by the Lune, Ribble, Mersey, and Weaver, all of which are short. But on the east coast the lowland strip widens out, and here and there considerable rivers like the Tyne, Wear, Tees, Ouse, Aire, and Trent have carved fine valleys whose lower portions are big enough to be termed plains.

The trend of the Pennines does not run in the same direction as that of the Cumbrian Mountains. The belts of Silurian strata in the latter form part of the zone of Caledonian folds and run northwest-southeast, as does the structural grain of the Southern Uplands of Scotland, the east of Ireland, and North Wales. But the great anticlinal arch of the Pennines, which has a north-south direction and is composed of Carboniferous beds, belongs to the zone of Hercynian folds. In the north, where the Pennines join the Southern Uplands, they widen out considerably, but they become narrower towards the south. On both flanks of the range the older rocks disappear beneath younger beds, and these in turn plunge beneath more recent strata. The Carboniferous dives under the Coal Measures, these under the Permian, the Permian under the Trias, and this under the Jurassic. Thus, the hills die away into the surround-

ing coastal lowlands, which grow wider as the mountains contract in breadth. The old routes leading from England to Scotland follow these lowlands, and are punctuated with ancient cities. On the west are Chester, Lancaster, and Carlisle ; on the east Lincoln, York, and Durham. The intervening moor-clad uplands were for centuries a world apart. Almost uninhabited and difficult of access, their only connexion with the rest of the country was due to their lead mines. But since industrial life invaded the dales and their swift-flowing streams and since the discovery of rich coalfields on the slopes and at the foot of the hills, the district has changed entirely and is now to be reckoned among the richest and most densely peopled areas in the world. It is the land of coal, iron,

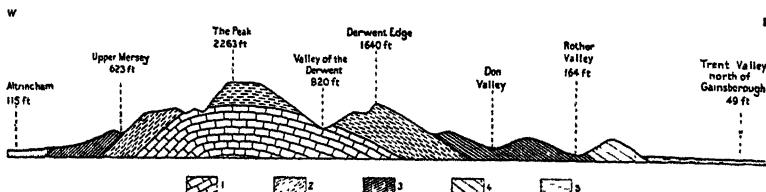


FIG. 47. Section from East to West across the Southern End of the Pennines from just South of Manchester to the North of Gainsborough.

- | | |
|-----------------------------|-----------------------------------|
| 1. Carboniferous Limestone. | 4. Magnesian Limestone. |
| 2. Millstone Grit. | 5. Triassic sandstones and marls. |
| 3. Coal Measures. | |

cotton, and wool ; of large seaports and big towns ; the very heart of the most typical industrial area in the British Isles.

1. SCENERY

THE PENNINES. The Pennine Range forms a mass of asymmetrical uplands which slope gently down towards the east and have their highest points on the west. These include Cross Fell (2895 feet), Mickle Fell (2591 feet), Whernside (2414 feet), Pen-y-ghent (2231 feet), Ingleborough (2373 feet), and the Peak (2088 feet). The materials of which their great upfold is composed belong to a series of very thick sediments of the Carboniferous system. The foundation of Mountain Limestone is overlaid with Millstone Grit, and this in turn is covered by a mixture of sandstone and clays which contains the Coal Measures. Denudation has removed the younger strata from the top of the fold and exposed the older beds which originally lay in the heart of the anticline. Hence, the mountains are now composed of a broad outcrop of carboniferous limestone flanked on either side by a more or less regular border of Millstone Grit and coal-bearing rocks. Coalfields lie on both slopes of the mountains, the Yorkshire coalfield corresponding to that of

Lancashire (see Fig. 47). But this symmetry is not continued from one end of the region to the other, for in the north there is nothing to balance the Northumberland and Durham coalfield, since faulting on the west has here carried the coal down to great depths.

In spite of the varied composition of the region, the hills have the same simplicity of outline and the same uniform appearance as is observed in all old mountain ranges. Smooth, regular, and slightly undulating features, known as 'fells' in the west, stand up on the ridge line. A journey from Derby to the Scottish Border along the Pennine heights would take one over nothing but heather moors. Often between the 1500 and 2300-foot contours, and at times even up to a height of 2600 feet, a thick layer of peat clothes the gentler slopes and flatter surfaces. The same open, monotonous, and desolate landscapes appear here as in other upland regions in the British Isles. The wild and rugged moors, however, play their part in the life of the valleys and lowlands, for, owing to the high rainfall, they have become a regular reservoir for the industrial towns below. All the big towns, except Manchester and Liverpool, derive their water-supply from the Pennine moors. The wild, graded bottoms of the upper valleys lend themselves to the construction of huge artificial lakes in which water may be stored. These broad sheets of water whose shining surfaces lighten the dismal moors are familiar sights, especially in places where the Millstone Grit outcrops. The towns all use the pure mountain water. The supply derived from the Millstone Grit has too little lime for drinking purposes, but is used with advantage in dyeing, owing to its softness ; and through this means the Pennines contribute to the prosperity of the textile industries in the Yorkshire and Lancashire valleys.

Across the high upland mass runs a network of deep-cut, picturesque valleys whose heads are nearly always to be found on the western, or higher, margin. These are known as 'dales' and include Tynedale, Weardale, Teesdale, Wensleydale, Nidderdale, Wharfedale, and Airedale. As usual, the valleys form a contrast with the hills, the dales with the moors. The valleys contain woods, permanent pasture, villages, and what little cultivation there is. They form little geographical units which for centuries lived apart from the outside world and were self-sufficient. In many parts the dalesmen still cling to their ancient customs and local patriotism. When the valleys are not filled with the smoke and noise of the mines, they are fresh and charming spots which prove attractive to tourists. The Derwent valley, which lies in the Peak District in the very south of the Pennines, is a belt of green, of woods and parks, which swarms with summer resorts. Some of these are country houses, standing in their own grounds ; others, like Haddon Hall

and Chatsworth House, are aristocratic residences ; others, spas, like Matlock or Buxton. When the valleys cross a district of more broken relief, where there are gorges, cascades, and escarpments, they lose the name of 'dale' and become 'cloughs' or 'gills.'

To describe the relief, it is not enough to contrast the valleys with the hills. The most peculiar features are due to the nature of the rocks and to structural influences. Carboniferous limestone yields a topography of its own. In the upper parts of Craven in the West Riding large bare patches, known as 'scars,' have the appearance of giant causeways ; whilst great clefts in the mountain sides form deep gullies which are full of cool, green vegetation. The highly soluble and much fissured surface of the limestone has developed all the classic features of a karstic drainage system, with swallets, dry valleys, gorges, disappearing streams, and vauclusian springs from which full-blown rivers issue through underground passages. Grottoes and caves are hollowed out in the bowels of the earth along the subterranean watercourses (see Plate XXXIA). Some of the best known examples are Peak Cave, which is quite near the village of Castleton ; Bagshaw Cave near Bradwell, from which a large stream issues ; Kirkdale Cave in Yorkshire ; and, best known of all, the famous Victoria Cave near Settle in Ribblesdale, where investigators have found valuable prehistoric remains.

Whilst limestone forms most of the surface rock in the northern and southern portions of the Pennines, Millstone Grit covers most of the central part, where it introduces differences in the topography. Being more resistant than limestone, it gives bold and vigorous features wherever denudation is active. It forms the cloughs, or wild steep-sided gorges, of the West Riding, and on the west of the Derwent valley it stands up in a high, narrow plateau whose 'edges' face the west in sheer walls. Wherever remnants of Millstone Grit lie scattered on the surface of the limestone plateaus, they stand out in prominent relief and form colossal, fantastically shaped humps. In the Peak District the so-called Peak is only a peat-covered platform of sandstone between 1700 and 2100 feet high. It is reached from the east by grassy slopes, but on the west it rises up in the rocky brow of Kinderscout, which is flecked with clumps of bilberry, bracken, and heather. In addition to the influence of the nature of the rocks, structure has played its part in shaping the relief. The limestone mass of which the Pennine upfold is composed dips gently towards the east and forms on the surface of the beds long slopes and broad, smooth plateaus. But in the west the limestone is broken by a line of faults, whose occurrence is marked by huge westward-facing escarpments. The most remarkable of these monoclinal features commands the valley of the Eden. Its top is

crowned by the moorland plateaus of the Fells, whilst its western face is gashed by narrow gorges and deep ravines. The same type of escarpment runs north-and-south along the western slopes of the Pennines, terminating in the vicinity of Giggleswick and Settle.

THE LAKE DISTRICT. The Lake District of Cumberland and Westmorland is an isolated group of mountains situated to the west of the Pennines. It lies between the Solway Firth and Morecambe Bay on the one hand, and between the Eden valley and the Irish Sea on the other. It owes its name to the number of beautiful lakes which it contains. In geological structure it resembles North Wales. On an extensive base of Silurian shales stands a mass of ancient and very resistant eruptive rocks which form the salient features of its relief. The highest peaks are Scafell Pike (3210 feet), Helvellyn (3118 feet), and Skiddaw (3055 feet). The district, which is hilly and difficult to move about in, is surrounded by a belt of valleys and plains. There is only one railway through it, and this runs across the middle of the area, availing itself of the Derwent valley in its course from Cockermouth through Keswick to Penrith. The main line from London to Carlisle avoids it by passing round its eastern margin.

In their relief the Cumbrian Mountains resemble a large dome with valleys radiating in all directions. The direction of the rivers and of the ridges separating them is independent of the structure and cuts across the ancient Caledonian folds without being affected by them. The radial arrangement gives clear proof of the influence of a very ancient mass of eruptive rock which forms the core of the district and has acted throughout all the cycles of erosion as the culminating point and centre of dispersion of the drainage system. From it run nine large valleys, all of which are occupied by long, narrow lakes. On the east are the valleys of the Eamont and Lowther ; on the west the deeper and more closely set valleys of St. John's Beck, the Derwent, Cocker, Ehen, Irt, Duddon, Crake, and Leven. They all bear fresh, strong marks of glaciation (see Plate XXXB). In their upper parts there are corries enclosed by jagged ridges, circular tarns, escarpments which are locally known as 'crags' and which face northeast, lateral and terminal moraines, and low passes through the ridges. Their lower portions are characteristically wide-bottomed, steep-sided valleys, with rock dams over which the streams tumble and, most striking of all, with beautiful lakes set in green vegetation. In the lakes the recent action of ice is apparent from the morainic dams, the *roches moutonnées* on their shores, the rocky striated islets, and the deep water. But fluvial erosion has already affected the once rugged features of the topography, and there are no wild, craggy slopes, except on the southern shores of Wastwater.

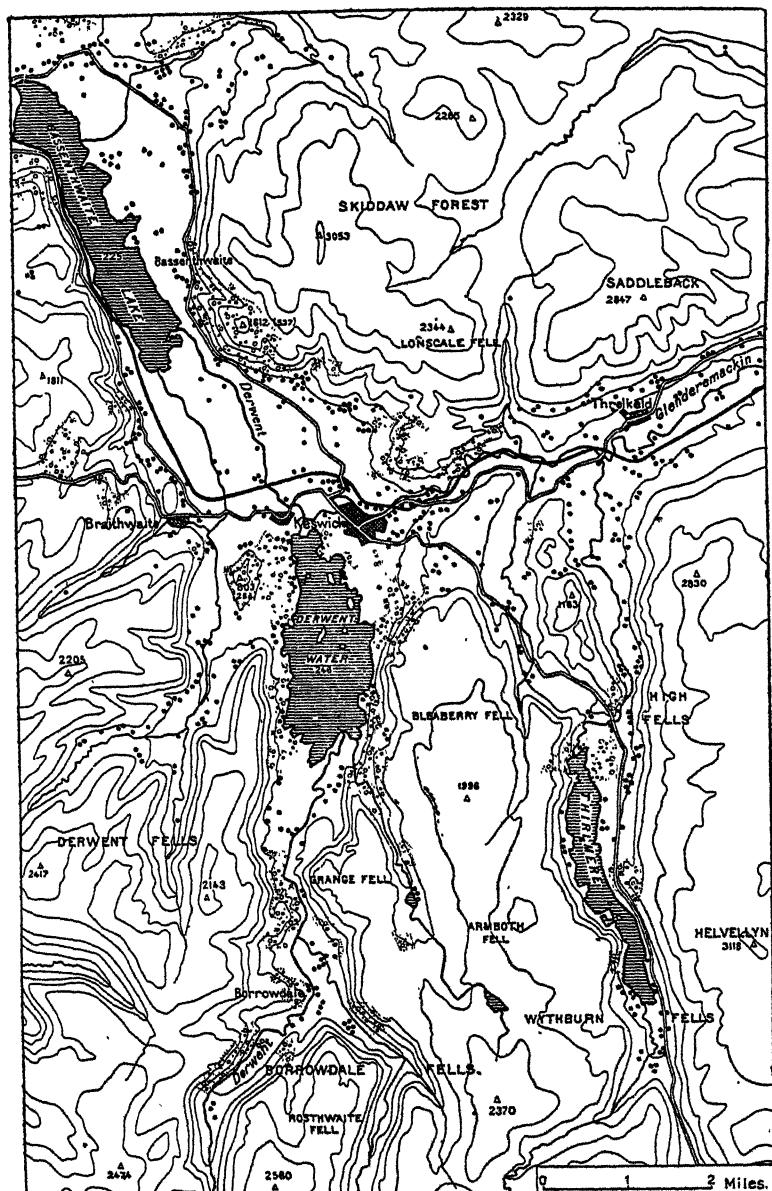


FIG. 48. Valleys of Thirlmere, Derwentwater, and Bassenthwaite. Note the contrast between the desolate, moor-clad uplands and the wooded valleys which are strewn with scattered dwellings. (Heights in feet.)

Thick woods, which have a fine appearance in the warm, damp air of the district, temper the rugged features of the landscape. The torrents have softened the lines of the rocky basins and filled up the shallower portions with sediment (see Plates XXIXC and XXXA).

The single lake which once occupied the Derwent valley has been separated into two, Derwentwater and Bassenthwaite, by a low strip of gravel and sand deposited by two mountain streams (see Fig. 48). Similarly, Crummock Water has been cut off from Buttermere by the sediments brought down by Sail Beck, and Hawes Water is threatened with a like fate by the growing delta of Measand Beck. This delta with its cultivated fields, which are the only arable portions of the valley, has been likened by Mill to an immense raft covered with earth and moored to the land. None of the lakes can escape the gradual effects of sedimentation, and even the largest, Windermere (nine square miles) and Ullswater ($5\frac{1}{2}$ square

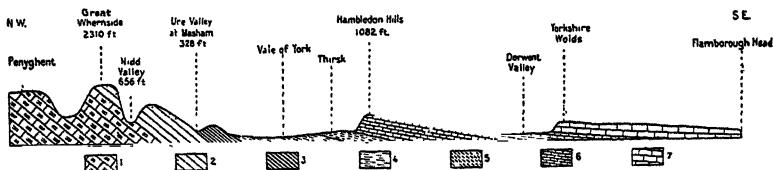


FIG. 49. Section from Northwest to Southeast across the Pennines and East Yorkshire from Pen-y-ghent to Flamborough Head.

1. Carboniferous Limestone.
2. Millstone Grit.
3. Magnesian Limestone.
4. Trias.
5. Liias.
6. Oolite.
7. Chalk.

miles), are being filled in by the deltas of mountain streams. Some of the lakes have actually disappeared, for the wide, flat, ill-drained meadows situated in the valleys of the Esk and Duddon and in Great Langdale in the upper part of the Windermere valley mark the former sites of lakes now silted up. These effects of recent erosion have given the landscapes in the Lake District a gentler, softer, and more regular character than that of the wild and rugged scenery of the Scottish lochs. A less severe sky and a less chaotic land make nature more pleasant here. The moors are less continuous, trees are plentiful, and the earth is carpeted with green. There is less grandeur and more charm than in the Highlands ; and it is this charm that inspired poets like Wordsworth and Coleridge.

Lowland strips bordering the Irish Sea on the one hand and the North Sea on the other fringe the two sides of the Pennines. But there are well-marked differences between the eastern and western strips. In Lancashire and Cheshire a layer of glacial deposits spreads its even surface over outcrops of soft Triassic beds, and across the flat, damp, impermeable drift the streams flow in wide meanders through peaty valley bottoms and among swamps. On

the other hand, in Durham and Yorkshire a series of escarpments cross the lowlands from north to south. The mountains dip down towards the younger strata of the 'Germanic Basin,' and as these strata also dip eastwards and southeastwards, a succession of outcrops of increasingly younger rocks occurs between the Pennines and the North Sea. Magnesian limestones of the Permian are succeeded by Triassic marls and sandstones, these by the limestone, clays, shales, and sands of the Lias, and then in order follow the limestones, sands, clays, marls, and sandstones of the Jurassic and the chalk of the Cretaceous. This series of strata gives rise to a succession of topographical belts in which the hard rocks form escarpments facing westwards, e.g., the plateaus of Durham, the Yorkshire Moors, and the Yorkshire Wolds (see Plate XLIIA); whilst the soft rocks form depressions and valleys like the Vales of York and Pickering and the valley of the Tees. This is the classic structure. Its fullest development is in the London Basin (Fig. 49).

2. INDUSTRIAL LIFE

The counties of the North of England remained agricultural up to the 18th century. Wool from the sheep reared on the moors was woven in the dales; but this was merely a local village industry which was scattered over the countryside and gave rise to no large towns. At this time the South and East of the island contained all the various types of towns which had grown up in the course of centuries: cathedral towns, market towns, university towns, nodal towns, and centres of trade and industry. But within a few generations the whole state of affairs was changed. Owing to the Industrial Revolution, the North became a new country in which the might of the factory crushed out of existence every other form of work.

Industry is based on the coalfields. In 1945, these produced 64 per cent. of all Britain's coal, including 80 per cent. (6.5 million tons) of Britain's 'open-cast' production. ('Open-cast' was a quarrying process introduced in 1942.) No other region in the world has witnessed a more vigorous application of the well-known law which makes the presence of coal a condition of industrial activity. Each of the coalfields has its cluster of manufacturing towns. This, the industrial part of England, has no geographical centre, but consists of several districts, each of which is as distinct and separate as are the five main coalfields.

The Cumberland coalfield stretches along the coast of the Irish Sea from Maryport to Whitehaven for a length of 14 miles and has a breadth of six miles. At Whitehaven the galleries of the mines run for nearly two miles out under the sea. In 1837, the galleries of one mine were driven too near the sea bottom in the neighbourhood of

Workington, and the water broke into the mine and destroyed it completely. Some of the coal seams are remarkable for their thickness and regularity ; but the fuel is not as good as that of Durham for coking or for domestic purposes. Moreover, the absence of estuaries like those of the Tyne and Wear has retarded the development of the coalfield.

The Lancashire coalfield, which runs east-and-west and is 32 miles long by $6\frac{1}{2}$ wide, yields coal of good quality and contains seams which are more than 6 feet thick. The chief mining centres are at Prescot, Oldham, Wigan (see Plate LVIB), Chorley, Bolton, Bury, Manchester, and Burnley. The coalfield produces one-twentieth of the coal raised in Britain, but suffers from two drawbacks which handicap its exploitation. The mean distance from the sea, some 20 miles, makes exportation more difficult than in Northumberland or even Cumberland, so that a high proportion of the coal is consumed in the district. Secondly, the faults which break up the seams cause unsteady production and create difficulties in working. Some of the shafts are among the deepest in Britain and go down to a depth of 2600 and even 3300 feet. Difficult geological conditions have caused a decline in the coalfield. In 1913 it produced one-tenth of the coal raised in Britain ; but between 1913 and 1936 production fell off by about 40 per cent. It would seem, therefore, that Lancashire will be outstripped by its rivals in the more favourably endowed coalfields in the Midlands.

The Northumberland and Durham coalfield, sometimes called the Northeast Coalfield, extends for about 50 miles from the Coquet to the Tees and attains its greatest breadth of some 20 miles in the Tyne valley. The coalbearing strata tilt upwards towards the northeast, where efforts have been made to work the outcrops that reach the surface under the sea. The coalfield has benefited from certain advantages : there is less faulting in the seams and, consequently, more regularity in the beds than in most other fields ; seams occur with an average thickness of over 3 feet, increasing in places to 5 or 7 feet ; nearly all the varieties of coal—domestic, steam, coke, and gas—are found here ; the coal is of a solid, compact texture, which reduces the proportion of small pieces and makes transport easier ; and the presence of tidal estuaries allows ocean-going vessels to moor right under the pit-heads (see Fig. 51).

The Yorkshire coalfield, which extends into Nottinghamshire and Derby, is exceeded in area by the South Wales coalfield alone. Its outcrops run from Leeds to Nottingham over a distance of 65 miles with a breadth ranging from 8 to 20 miles. Its coal-beds dip towards the east under more recent formations. Its shallow and almost undisturbed seams are easily worked, and some are extraordinarily

rich. The Silkstone seam, for instance, is 5 feet thick or more and yields excellent household coal, whilst the even richer Barnsley seam, which is between 4 and 5 feet thick and runs under the whole field, contains coal which is excellent for both domestic and industrial purposes. It has been calculated that this seam alone produces more than one-third of the coal in Yorkshire, for it is also worked in the 'concealed' areas farther east (see Fig. 53). Since the discovery of the extension of the coal-beds under the younger rocks lying to the east, deep shafts have been sunk to reach the mineral.

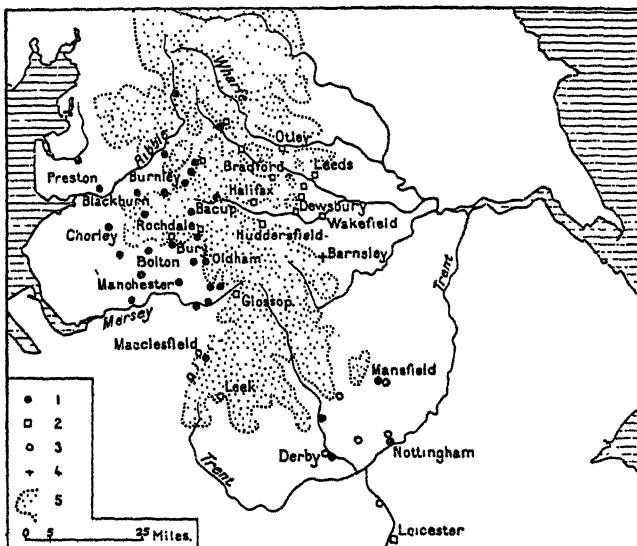


FIG. 50. Centres of Textile Industry in the North of England.

- | | |
|-------------------------|-------------------------------------|
| 1. Cotton manufacture. | 4. Linen and jute manufacture. |
| 2. Woollen manufacture. | 5. Area above the 600-foot contour. |
| 3. Silk manufacture. | |

Until this was done, the Yorkshire coalfield, which was situated inland at the foot of the Pennines far from the sea and navigable rivers, produced fuel solely for the district round about. But now that the concealed area has been worked, the mining centres of Doncaster, Mansfield, and Thorne are close enough to the Humber to be able to export their surplus coal.

Lastly, the North Staffordshire coalfield is situated in the south of the region, where it is in contact with the Midlands. It is less extensive, but richer, than the South Staffordshire field. Instead of being bounded by faults which carry the coal down to immense depths, the workable beds dip gently towards the southwest under a

covering of Permian and Triassic rocks. Consequently, easily worked supplies still remain at no great depth, and, it should be noted, iron ore is found here, as in the west of the Midland Valley of Scotland, sandwiched in between the coal seams.

Each coalfield forms an industrial area. Hence, within the compass of the Pennines five districts of intense industry and dense population have grown up and spread along the slopes and valleys which were once peaceful and sparsely inhabited. Considered on the map, these districts appear to be cut off from each other by desolate hills, and it might be thought that they work separately and live independently. But, in fact, while each devotes itself to its own specialised task, together they form a single community identical in character and social development. In them the interchange of ideas and the movement of people and goods are more easily achieved than might be believed from the appearance of the topography (see Fig. 50). Communication between the two opposite slopes of the Pennines is easy, because the valleys form wide transverse gaps and low passes allow roads, railways, and even canals to cross over. The most northerly of these passes, called the Tyne Gap by geographers, runs from the valley of the Eden to that of the Tyne and presents no greater obstacle to traffic than a water-parting little more than 500 feet high. The Romans chose it as a line of defence against the Picts and Scots and established their great wall along it from sea to sea. Today it is used by the railway from Carlisle to Newcastle. Another gap connects the Eden with the Tees by way of the Greta valley. Here the railway from Carlisle to Middlesbrough crosses the Stainmore Gap at a height of 1200 feet.

At the Aire Gap a number of valleys, including those of the Wharfe, Aire, and Calder on the east, and those of the Ribble and Mersey, together with their feeders, on the west, almost penetrate the mountains and cause a break in their continuity. As the ridge-line here falls to about 500 feet, the gap affords a passage for the railway lines which connect Yorkshire and Lancashire. A single tunnel on each line is enough to allow communication between the woollen and the cotton towns to be effected almost as easily as over a plain. Moreover, three canals cross the range at a height of 475, 590, and 640 feet respectively. One connects Leeds with Blackburn, another Halifax with Rochdale, and the third Huddersfield with Manchester. Since these canals across the Pennines are frequently interrupted by locks, they have never carried much through traffic. But they illustrate the ease with which the hills may be entered or even crossed. Every valley has its own route. Experience has shown the impracticability of waterways, but a network of roads and railways conform to the windings of the valleys between the high moors

and establish close connexion between east and west. A comprehensive view such as may be had by climbing to a commanding position on the high moors brings home the realisation of the intimate connexion and unity which exist between these smoke-ridden, teeming valleys. On either side of the pass rows of houses which run alongside the railway and the stream reach almost up to the waterparting. The hum of industry continues uninterrupted by the Pennines, and industrial villages climb almost to the ridge-line. There is a striking continuity in the swarming populations which fill the valley bottoms on either side of the mountains.

3. CUMBERLAND

In spite of the mountainous nature of the district, towns grew up in very early times on the Solway Plain along the great natural highway from England to Scotland, which passes through the valleys of the Eden and Nith. Carlisle was first a British fortress, then a Roman station. Its cathedral and its position as the see of a bishop and a county town go back far into its historic past. From its strategic position it has inherited its large railway junction, where meet routes from Glasgow, Edinburgh, Newcastle, Manchester, Liverpool, and Belfast. It has a population of 57,100 and engages in a certain amount of industry, mainly cloth-printing and machine manufacture. But it is the only large town in the district. At the foot of the Cumbrian Mountains the only towns are little life-centres situated at the junctions of the upper and lower valleys of the rivers. The chief are Penrith, Ulverston, Kendal (which produces woollen textiles), and Keswick (which has pencil works).

Today the busy towns are all on the coast, near the coal and iron. The ports of Workington, Maryport, and Whitehaven live by mining and exporting coal, mainly to Ireland. The presence of iron ore near Egremont, Millom, and Barrow-in-Furness confers another source of wealth on the coastal area. This ore is an excellent hematite, rich in iron content and non-phosphorous, and is much sought after for the production of fine steel in Glasgow, Sheffield, Birmingham, and Middlesbrough. As soon as it began to be worked, various kinds of metallurgical installations sprang up nearby. But neither the coal nor the ore from the region fulfils local needs, and the factories now partly depend on Durham for their coke and on Spain for their ore. The blast furnaces in Workington could not work without raw material from abroad. The same conditions prevail in Barrow-in-Furness, the chief centre of metallurgical production in the district. This town lies at the southern end of the Furness Peninsula, which is situated between the estuaries of the

Duddon and Leven. Near it are rich iron mines which were untouched until the middle of the 19th century. Its growth was phenomenal. From a mere village in 1826, it had increased by 1881 to a town with a population of 47,000, and this number had risen to 66,300 by 1931. Near the blast furnaces and steel works, shipbuilding yards have grown up on the shores of the sound which separates the long, narrow island of Walney from the mainland. Along the creeks and on the low islands in these calm waters industrial establishments found plenty of convenient space. The shipyards employ more than 10,000 men and build cargo-boats, warships, yachts, dredgers, and metal pontoons. This is the sphere of operations of the great firm of Vickers, Armstrong, Ltd.

4. NORTHUMBERLAND AND DURHAM

Shut in between the moors and the sea, the coastal plain and foothills of Northumberland and Durham form one of the two great historic routes from England to Scotland. The district long remained a debatable land between the two countries and was a battlefield dotted with castles. Between the Tees and the Tweed lie the fortresses of Chester-le-Street (the seat of the 10th century bishop of Bernicia), Morpeth, Alnwick, Bamburgh, Belford, and Berwick. Historically, the chief centre is Durham, whose population amounts today to 16,000. In modern times the town has spread out over the flat banks of the Wear ; but the old city containing the cathedral and the castle stands on a rocky peninsula which is almost completely surrounded by a bend in the river (see Plate LVB). Here, in his castle on the frontiers of 11th-century England, the Bishop of Durham, who became Earl of the County Palatine after the Norman Conquest, lived for centuries like the sovereign of an independent principality. Until comparatively recent times the city was a bulwark of defence against the inroads of the Scots. The memories of these times, together with the ancient buildings, give a charm to this city of the past. Today it is the county town ; but the activities of the district have moved to the coalfields along the estuaries of the Tyne, Wear, and Tees. For a distance of 45 miles along the coast there is an extraordinary concentration of industry, including coalmining, the production of iron and steel, shipbuilding, machine shops, and chemical works. The estuaries all harbour large seaports which engage in a trade in heavy goods. These ports account for more than 10 per cent. of the shipping trade and ship one-third of the coal exported, and produce one-quarter of the pig iron manufactured in the United Kingdom (see Fig. 51).

THE TYNE AND NEWCASTLE. The first hills that overlook the

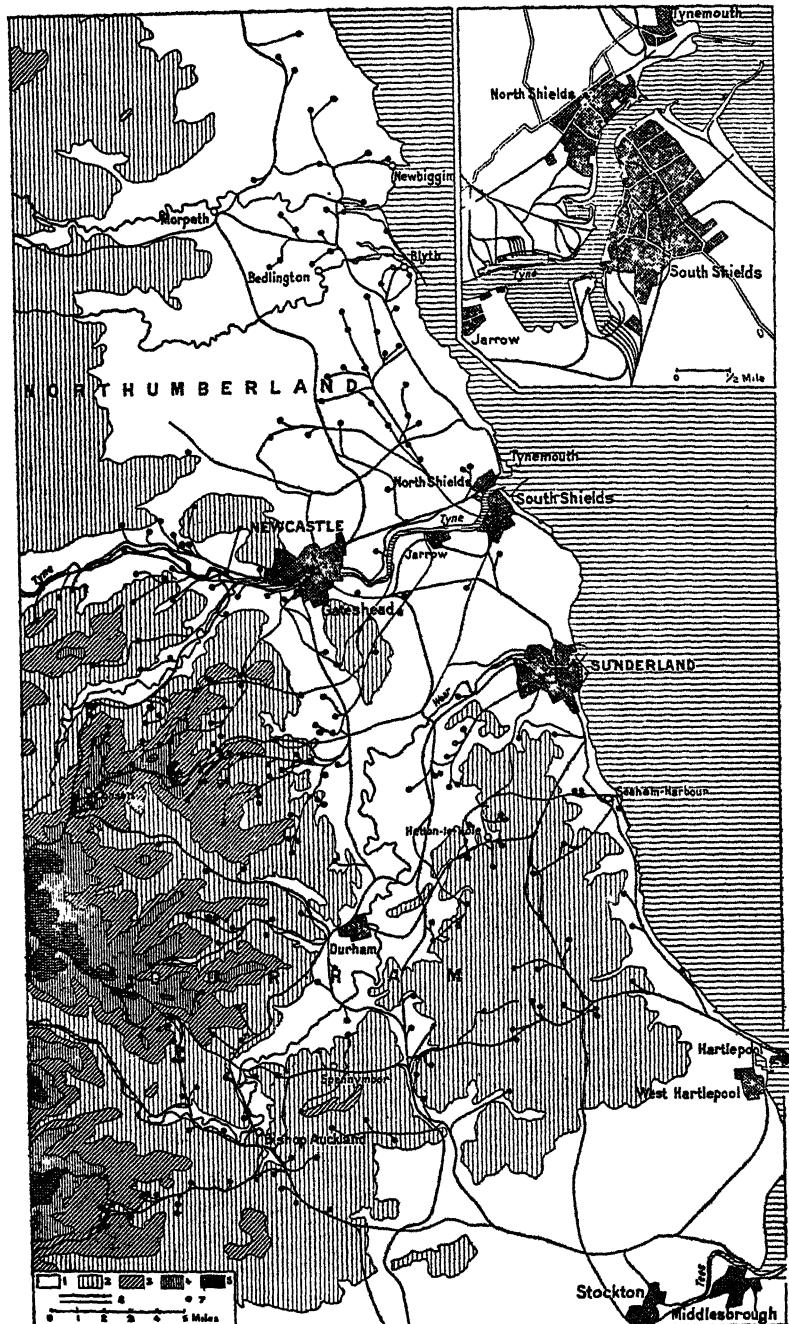


FIG. 51. The Northeastern Coalfield.

- | | |
|----------------------------------|---------------------|
| 1. Less than 300 feet above O.D. | 5. Above 1000 feet. |
| 2. Between 300 and 600 feet. | 6. Railways. |
| 3. Between 600 and 800 feet. | 7. Mineshafts. |
| 4. Between 800 and 1000 feet. | |
- Inset : The estuary of the Tyne.

Tyne valley rise on the left bank of the river 10 miles from the sea. The valley becomes narrower between these higher slopes and lends itself to the construction of a bridge. Here, at a point reached by the tide, the site of Newcastle was chosen (see Plate XXIXA). Its strong position on the lowest bridge and at the limit of sea navigation caused the Romans to adopt it as a military station on the road to Scotland. The coal trade, which has been the basis of the prosperity of the town in modern times, began as far back as the Middle Ages. At the beginning of the 14th century, Newcastle was already shipping coal to London, and by 1615 400 ships were engaged in this trade. The arrangements of the carboniferous beds gave, and still give, a wonderful advantage to the export of coal, for the mineral is mined near the quays and avoids the expense of overland transport. Furthermore, the Tyne passes through the beds, and many mines have their shafts on the hillside above the river ; hence, by the mere force of gravity the cargoes of coal were just shot down to the wharves. Large wooden frames, or ' staithes,' which are peculiar to the Northeastern ports, are the means by which the coal from the pitheads is carried on trucks to the riverside and thence emptied direct into the ships moored in the river (see Plate LIVB). Easily mined, moved, and exported, coal dominates Tyneside industry. At the present day it represents more than 55 per cent. of the value of the exports of Newcastle and more than 95 per cent. of the weight of goods shipped. It controls the foreign trade of the port, which imports wood from the Baltic and grain from South America in exchange for the coal shipped to those countries.

All the various types of industrial operations carried on in Newcastle and its satellites arise out of the coal trade. Transport of the fuel by large numbers of ships has led to the establishment of shipyards on the banks of the estuary. From Elswick to South Shields through Walker and Wallsend, a distance of seven miles, there is a series of gigantic yards in which all types of vessels are built : cargo-boats, turbine steamers, and warships ; and others in which the machinery for these ships is manufactured. In 1937 the tonnage launched amounted to 102,000, this figure not including warships. To the ships actually built here must be added British and foreign vessels which are repaired in dry or floating docks. Tyneside itself produces comparatively little of the metal used in the shipyards, blast furnaces and steelworks being chiefly concentrated on Tees-side and at Consett, ore being obtained from the Tees district (Cleveland), from Spain, Sweden, and the Mediterranean (see Plate LIVB). The treatment of copper derived from the roasting of pyrites may also be mentioned. Lead foundries, which at first were supplied from mines farther inland, now use ore brought

by colliers from Spain. Chemical industries also arose out of the coal trade, but to-day the chemical industry of Northumberland and Durham is largely concentrated on the north bank of the Tees at Billingham. As a return cargo, the colliers long brought back nothing but ballast, which they discharged on the already overcrowded banks of the estuary. The idea was formed of bringing back heavy goods which could be utilised ; for example, crude salt for the manufacture of soda, Spanish pyrites for making sulphuric acid, and chalk for the production of chloride of lime. Then as a natural consequence appeared the manufacture of chemical products like glass, dyes, soap, and petrol. Sources of power also sprang from the metallurgical industry itself, for, by the utilisation of the gas from the blast furnaces and coke ovens, enormous quantities of electric power daily increase the means at the disposal of industry.

The large number of mines and factories has deprived the district of its natural scenery. Whilst along the Clyde charming views are still to be seen across fields, meadows, woods, and moors, the Tyne reaches the sea below Newcastle through dense clouds of smoke, crowded rows of factories, and hillsides blackened from top to bottom with an ocean of bricks and mortar. On each side of the valley there is a closely packed row of towns. This is the Tyneside district, whose population was 200,000 in 1851, but has now reached nearly 800,000. It includes Newcastle (pop. 283,000), Gateshead (122,000), South Shields (113,000), Tynemouth (65,000), and Jarrow (32,000). To the north of the Tyne two younger centres comparable with those of the Tyneside agglomeration, Blyth (32,000) and Amble, join in exporting coal. As at Barry in South Wales, the whole equipment of a coal port was installed in them as it were overnight.

THE WEAR AND SUNDERLAND. Shipbuilding and the export of coal give occupation to the 186,000 inhabitants of Sunderland, the seaport on the Wear. Here, as on the Tyne, the two industries are associated, the abundance of fuel having attracted the working of iron. But the Wear cannot be compared with the Tyne either in the variety or activity of its factories. Sunderland is even more than Newcastle a coal port. The preponderance of trade in the fuel may be gauged by examining the imports and exports. Ninety per cent. of the shipping arrives in ballast, and nearly all the cargoes landed consist of pitprops ; on the other hand, 95 per cent. of the vessels which leave the port carry full cargoes of coal. The shipyards on the Wear used to build merchant vessels for the most part and specialised in the construction of colliers and oil-tankers. Before 1920 the output of the yards represented two-thirds and coal nearly one-third of the total value of the exports. The shipyards,



[Photo: M. R. N. Jackson.]

A. NEWCASTLE-UPON-TYNE

The main L.N.E.R. line to Scotland crosses the Tyne by the bridge on the left.



[Photo: Champagne, Paris.]

B. WHITBY, YORKSHIRE

The town is situated on an estuary and is sheltered by the surrounding hills.



[Photo: Champagne, Paris.]

C. WINDERMERE

The countryside, which is shared between cultivation and woods, was formerly overrun by a glacier.

[To face page 196.]

PLATE XXX.



[Photo: Lupton, Bradford.

A. A VALLEY IN THE LAKE DISTRICT

This partly cultivated and partly wooded country-side lies near Kendal. The village in the middle is Long Sleddale.

[Photo: Lupton, Bradford.

B. A GLACIER-FORMED VALLEY IN THE LAKE DISTRICT

The view, which is taken from Kirkstone Pass, shows Brotherswater in the distance



[Photo: Lupton, Bradford.

C. A TYPICAL INDUSTRIAL TOWN IN YORKSHIRE

Note that the town, which is Hebden Bridge, lies at the bottom of a valley.



[Photo: Lupton, Bradford.

D. A VALLEY DROWNED BY THE SEA

An arm of Morecambe Bay seen from Grange-over-Sands.



once the source of the prosperity of the port, were hard hit by the world depression in shipping, and Sunderland launched only 2628 tons in 1932 and 11,600 tons in 1933 as against 333,000 in 1920. On account of this, the yards and factories adapted themselves to the production of motors and ship machinery and to repair work. In 1938 naval rearmament brought new life to the yards; and to-day the need to replace shipping sunk during the war keeps the industry busy. These two main industries overshadow all others, but there are paper and flour mills, breweries, and sailcloth factories. Seaham, which is situated five miles south of Sunderland, is a mere annexe of the larger town, with which it collaborates in the export of coal. Still farther south is the new town of Easington—an interesting social experiment. It has been designed especially for miners, well away from sight of the pit-head machinery.

THE TEES AND MIDDLESBROUGH. The teeming industrial area on the Tees is a 19th-century creation. In 1850 it scarcely existed ; but subsequently it grew with the rapidity of a mushroom town in the Western States of America. The population of West Hartlepool increased from 300 in 1845 to 12,000 in 1858 and 68,000 in 1931. That of Middlesbrough jumped from 150 in 1831 to 4460 in 1841, to 55,300 in 1881, and 138,000 in 1931. Nearby are Stockton with 68,000, Darlington with 72,000, and Hartlepool with 20,000.

At the beginning of the 19th century Hartlepool was but a fishing village situated on a rocky peninsula on the north bank of the Tees estuary. When coal was found in the southeast of County Durham, a railway company built a dock at the village in 1840 in order to ship the fuel. Soon after, in 1847, another company built a coal wharf on some marshy ground to the west of Hartlepool. This grew into the town of West Hartlepool, which by degrees became the port of despatch for great quantities of coal from southeastern Durham and the landing place for pitprops. Shipyards and, later, metallurgical works were set up near the coal wharf. But this industrial prosperity is only an extension of the great metallurgical centre which has grown up at Middlesbrough.

Middlesbrough itself had begun as a coal port. But its prosperity dates from the discovery of the Cleveland iron beds close by. The ore, which was first worked in 1850, gave an impulse to the production of pig iron, which rose from 24,300 tons in 1851 to 468,000 tons in 1860. But as in this ore the percentage of phosphorus contents is high, the great expansion of metallurgical industry in the town dates only from the application of the Thomas process. After its adoption the blast furnaces produced two million tons of iron in 1890. On Tees-side everything combines to favour the iron industry : mine and factory are close together, for, though the distance

between them has increased as the mining has moved south, it does not exceed an average of 15 miles ; the adjacent Durham coalfield supplies excellent coke ; there is an abundance of lime needed for flux ; and the estuarial position allows the importation of Spanish, Scandinavian, and Algerian ores. These last are treated separately or mixed with the native product. There are more than fifty blast furnaces with their accompanying steel works within a radius of 12 miles of Middlesbrough. Neither the Midlands nor Wales, nor even Tyneside, can compete with the Tees district in the production of pig iron, and enormous quantities are sent to the factories in Sheffield, Birmingham, Scotland, and Newcastle. Tees-side supplies foreign countries which are poor in ore or coal ; mainly the North Sea and Baltic countries, Italy, the Dominions, South America, and Japan. The products of the blast furnaces are taken by great finishing firms and are used in manufacture. Steel works turn them into ingots, rails, girders, and steel sections ; shipyards use them for the construction of vessels ; workshops make them into bridges, scaffolding, railway fittings, and machinery ; and munition factories, wire-works, and tube and piping factories employ them for their various purposes. The production of chemicals, which began with the treatment of the pyrites of iron, now finds a rich source of raw materials in the rock salt contained in the local Triassic beds. Soda, sulphuric acid, and their associated products are manufactured, and much raw material is despatched to the other chemical factories in the Northeast. From Middlesbrough the iron industry has spread along the coast and up the Tees valley, for coal and raw material are found almost on the spot throughout the district. Thus, on the coast blast furnaces spread southwards to Skinningrove, whilst steel works extend northwards to Seaton Carew and West Hartlepool. Inland along the Tees metallurgical factories extend to Stockton and Darlington ; machine works to Stockton ; bridge, locomotive, and metal cable works to Darlington.

Between all these industrial establishments on the Tyne, Wear, and Tees there is one attribute, in common. The nature of the work, which demands cheap transport for heavy material, has necessitated the building of a large port on each of the rivers. The construction of wharves and docks and the deepening and straightening of channels, have made these estuaries veritable works of art.

5. LANCASHIRE

Liverpool is only 30 miles from Manchester, and, measured north and south, the distance from the Mersey to the Ribble is hardly 24 miles ; yet on this tiny plot of earth live five million souls. The district is the classic home of large-scale manufacture and the

cradle of the Industrial Revolution. Its beginnings were unlike those of the coal and iron district in Northumberland and Durham, for coal was not the creative principle in the industry of Lancashire. Previously to the exploitation of coal as a motive power two causes had operated : firstly, there was the existence of a rural population accustomed to the spinning and weaving of wool ; then, there was the presence of a commercial centre of long standing at Liverpool. When the use of coal introduced a new source of power and wealth, rich capitalists and a business tradition already existed in the district. Two leading cities sum up the spirit of Lancashire : Liverpool, the port and gate to the Atlantic ; and Manchester, the centre of industry and the headquarters of the cotton trade.

LIVERPOOL. On the right bank of the Mersey on the present site of the Liverpool Customs House and Paradise Street lay the Pool, snugly sheltered from the force of the tide. On its shore was a fishing village built among woods and marshes. The first historical mention of this settlement dates from 1191. But this humble spot occupied a favourable position on the route connecting the English Plain with the Irish lowlands. Hence, from the day that the English established themselves in Ireland, Liverpool became a seaport for communication with that country. This first form of commercial enterprise was the only activity on which it embarked up to the beginning of the 16th century ; but even in 1590 the then little town still contained only about a thousand inhabitants.

The arrival at Liverpool of a ship laden with tobacco from the West Indies is first recorded in the early years of the 17th century, and this simple fact heralded the gigantic transatlantic trade on which the importance of Liverpool's commerce with the colonies was destined to be based. Soon there grew up a trade in tropical products from the West Indies, including sugar, tobacco, and cotton. The first sugar refinery was established in the town in 1668. Other profitable ventures were achieved in the contraband trade with the Spanish colonies, Liverpool displacing Bristol as the headquarters of this activity. Then came the slave trade with the plantations in America, in which Liverpool was deeply involved from the beginning of the 18th century. In 1792, it monopolised five-eighths of the British and seven-eighths of the European trade in 'ebony-wood.' Shipping firms and merchants in Liverpool made enormous profits out of it. Between 1783 and 1793 more than 300,000 negroes crossed the Atlantic in ships belonging to the port. It might be said that the colossal wealth of the town was built up out of this trade in human beings. With the funds so gained the town was able to construct docks, fit out its ports, and create the effective means of raising itself to the position of one of the world's greatest *entrepôts*.

Up to the beginning of the 19th century Liverpool traded particularly in colonial produce, and to this the town owed its growth from a population of 5,000 in 1700 to one of 35,000 in 1775, and the increase of its shipping from 27,000 tons in 1710 to 540,000 tons in 1791. By the middle of the 18th century Liverpool had outdistanced Bristol and taken second place to London. It bought, transported, and resold tropical produce, distributing it throughout England and the Continent. At the present day it remains together with London one of the only two places in Britain from which large quantities of goods are re-exported. Re-exports amount to one-fifth of the total trade of Liverpool and include cotton, cereals, wool, and rubber. But this broader function has been gradually supplanted by the growing importance of the town as a port for its own district, owing to the industrial development of its backland.

Liverpool serves the enormous industrial area which covers the whole of south Lancashire, importing most of the foodstuffs and raw materials required and exporting a good deal of its manufactures. In spite of the competition of Manchester, it imports three-fourths of the raw cotton destined for manufacture in Britain. Besides this, it imports wool and hemp for the textile industries ; ore and partly worked metals for the metallurgical industries ; corn, meat, cattle, fruit, sugar, beverages, eggs, butter, and cheese for feeding the population of the district ; manure, oil-cake, and oil-seed for agricultural purposes ; and wood, tobacco, petrol, and tallow for general needs. Comprising neither agricultural nor mineral products, the exports mark the port out as belonging to an industrial area. They consist of cotton cloth and yarn from Lancashire, machinery and iron goods from the Black Country, woollen goods from Yorkshire, and chemicals. The flow of exports is so strong and so well organised that nearly every district in Britain sends through Liverpool the goods which it destines for shipment. In contrast with London, which, owing to its character as a vast centre for the consumption of goods and as a focus for *entrepôt* trade, imports far more than it exports, Liverpool exports nearly as much as it imports.

While the functions of Liverpool were growing more complicated and extensive, the port was widening its commercial relations. After the decay of the slave trade, the United States were opened up and became the main source of raw cotton for Lancashire. Trade relations with the States have remained, so to speak, characteristic of the commerce of Liverpool, and they have increased in regularity and extent as each country specialised more and more in its aims, England turning out manufactured goods, the United States concentrating on raw materials and foodstuffs. With the flow of merchandise goes a broad stream of travellers. Passenger traffic with

the United States has recently been transferred to Southampton, but Liverpool formerly monopolised it. The first sailings of liners on a regular schedule started from her docks, and a regular fortnightly service to New York was established by the *Britannia* in 1840. The name of the Cunard Line is bound up with the history of Liverpool. Other ports have competed in fast services to Africa and the Far East, but Liverpool still maintains a very vigorous connexion with the United States. From its former trade with the Guinea coast

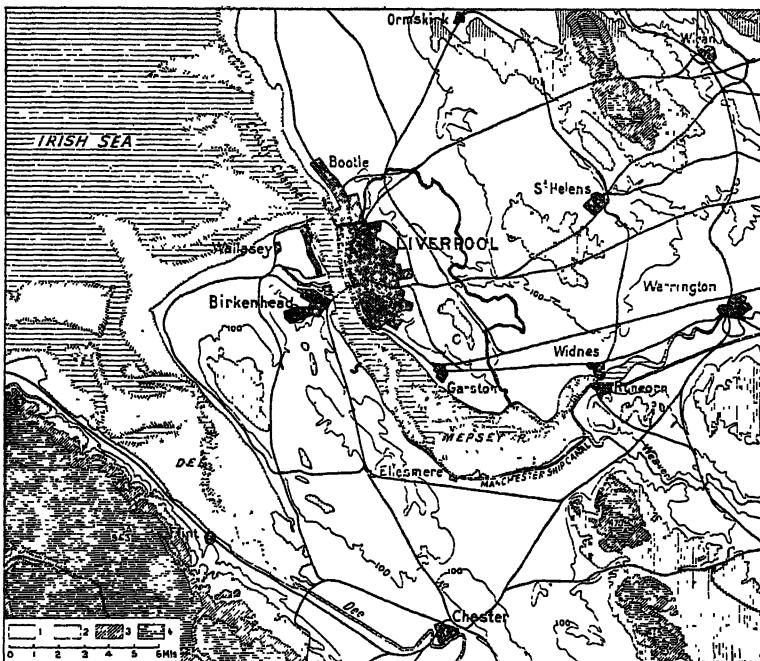


FIG. 52. The Estuary of the Mersey and Liverpool.

- | | |
|---------------------|---------------------|
| 1. 0 to 200 feet. | 3. 300 to 400 feet. |
| 2. 200 to 300 feet. | 4. Above 400 feet. |

it retains a large trade in West African oil-seed. Other forms of trade are due to the industrial needs of the backland. Wool is imported from Australia, cotton from Egypt, rubber from South America, wood, corn, butter, and cheese from Canada, and cotton stuffs are exported to India and the Far East. This overseas trade has made Liverpool one of the greatest ports in the world, and the shipping (exclusive of coastwise trade) which entered and cleared amounted to 1,678,000 tons in 1835, to 16,000,000 tons in 1905, to

21,690,000 tons in 1922, and to 27,283,000 tons in 1936. Through it pass one-third of the exports from, and one-fifth of the imports into, the United Kingdom. It owns one-third of the tonnage of British shipping. In 1924, the value of merchandise which went through it amounted to £582 millions, and in 1936 to £297 millions, the corresponding figures for London being £677 millions and £510 millions.¹

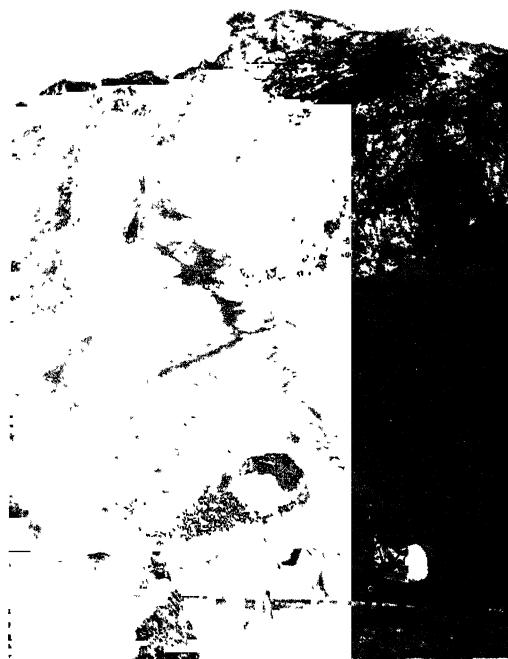
The Mersey estuary (see Fig. 52) on which Liverpool depends for its existence as a seaport possesses a striking superiority over all other inlets on the same sea. The huge volume of water displaced by the rise and fall of the tide sweeps its narrow mouth clear of sand and mud. Thus, a deep permanent channel leading from the muddy upper portions of the estuary, which are being slowly silted up, to the lower portions, which are honeycombed with sandbanks, ensures a fairway for shipping. Whilst navigation on the Ribble and Dee was gradually killed by the process of silting, Liverpool was spared. Off the town the river is between 50 and 60 feet deep. But that is as far as nature's assistance went, and the task had to be finished by vast engineering works.

The Mersey estuary empties westwards into the Irish Sea through a bar which is impeded by sandbanks. In the main passage, known as Crosby Channel and used by nearly all ships, the depth of the water over the bar was sometimes reduced at very low tides to 8 feet. This presented no obstacle to navigation until 1890, when the increased size of ships made the entrance to the Mersey dangerous for larger vessels, which were therefore obliged to wait outside for the tide to rise. Great operations were undertaken to deepen the channel, and, thanks to the work of the colossal dredgers employed any ship now afloat can enter or leave Liverpool, whatever the state of the tide.

The great contribution made by Liverpool to the history of harbour engineering was the invention of the wet dock. The deep water of its estuary was exposed to storms, constantly subject to strong tidal streams, and affected twice a day by a tidal range of 26 feet. Hence, there was no guarantee of security or regularity in its shipping operations. To shelter the work, it was decided to construct wet docks which would be closed by sluices. The Old

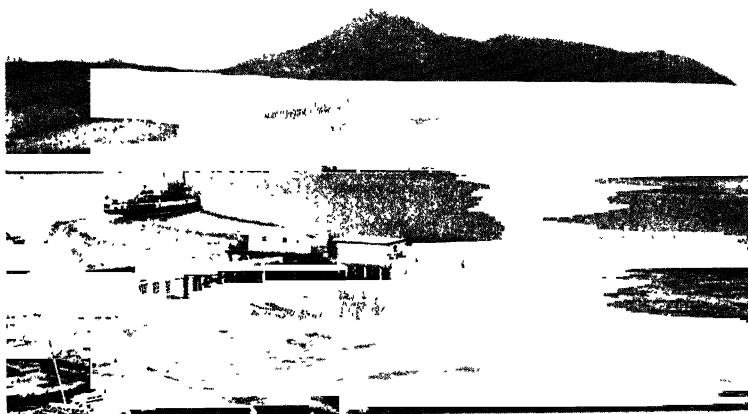
¹ In spite of the decline in world commerce in the last few years, Liverpool still trades with the whole world. The tonnage of shipping which entered the port in 1936 may be analysed according to its origin as follows : 3,643,000 from North America, 1,830,000 from South and Central America, 2,431,000 from Europe and the Mediterranean, 1,051,000 from countries on the Indian Ocean, 949,000 from Australia, New Zealand, and the Pacific Islands, 410,000 from the Far East, 599,000 from West and South Africa, and lastly, 1,010,000 from the Irish Free State.

PLATE XXXI



[Photo. Frith.

A. REYNARD'S CAVE IN DOVEDALE, DERBYSHIRE
A limestone bluff with caves in its face.

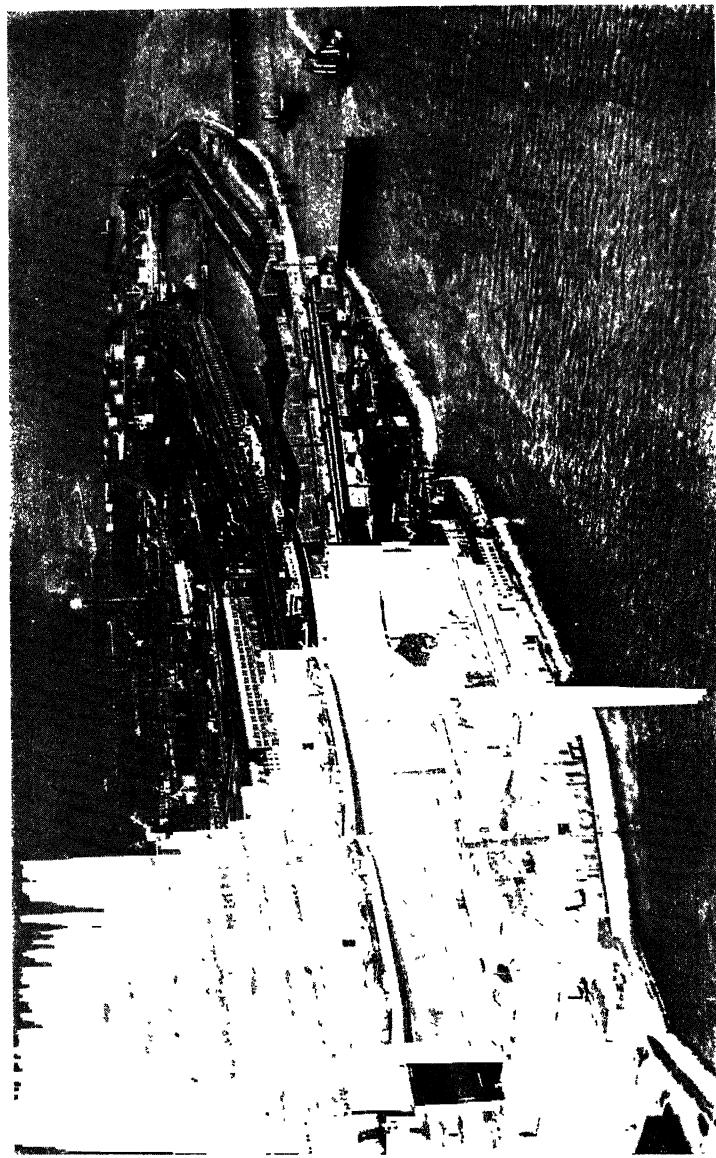


[Photo: Valentine.

B. THE ISLE OF ARRAN
Goat Fell (3081 feet) is the conical hill in the background. In the foreground is Brodick Pier

[To face page 202.

PLATE XXXII



VIEW OF LIVERPOOL DOCKS

[Photo: Aerofims.]

Dock, which was begun in 1709 and came into use in 1715, is the oldest wet dock in the world. Another, Salthouse Dock, was constructed in 1734 for the Cheshire salt trade, and four others followed between 1756 and 1815. Eight more were constructed between 1815 and 1835, after which, as the traffic increased, came a whole row lining the east bank of the Mersey for a distance of eight miles. On the other bank at Birkenhead another series of docks were built on an old channel of the river, known as the Great Float. So, for the whole of the great harbour in the Mersey estuary forty docks were built, giving some 37 miles of wharfage.

The growth of the city has kept pace with the expansion of the docking facilities on which its prosperity rests. The population increased from 25,000 in 1760 to 165,000 in 1831, to 716,000 in 1901, and 855,000 in 1931. At the same time villages beyond the confines of the city itself have developed into towns. Bootle has a population of 77,000, and Seaforth, Litherland, Waterloo, and Crosby together contain 65,000 inhabitants. On the left bank the dunes and swamps of the Wirral are disappearing under houses. The population of Birkenhead amounted to 148,000 in 1931, and that of Wallasey to 97,000. Seacombe and New Brighton are now residential suburbs. The Mersey acts as a central avenue in these swarming towns, and hundreds of ferryboats connect its two banks. An electric railway and a main road tunnel beneath the river.

Local water supplies are inadequate for so large a city ; hence, in the mountains of North Wales a huge artificial reservoir, known as Lake Vyrnwy, has been constructed, from which water flows down through an aqueduct 70 miles long. Summer resorts for the people of Liverpool have been formed at Hoylake, Southport, Blackpool, and even in the Isle of Man and North Wales.

In the course of its rapid development the city has absorbed into its population emigrants from distant parts of the country. Scotland supplied many, but the majority came from Ireland. The number of Irishmen in Liverpool is large enough to fill whole quarters of the town. The growth of the city took place so rapidly that the whole place shows marks of hurried expansion. Concentrating wholly on business affairs, it neglected beauty and hygiene as it grew. Houses were set up without order or elegance, and their monotonous rows harbour an atmosphere of gloom. The only part of the city which bears evidence of architectural care is the central area near the two big railway stations. Here the museums, the Public Library, and the theatre are all grouped round St. George's Hall. Open spaces in this sea of bricks and mortar were provided only in the much later stages of expansion, and, consequently, the

parks are all on the outer edge of the town. Similarly, this metropolis of commerce was long in awakening to the things of the intellect. By virtue of the principle of division of labour, the care of looking after these matters was deliberately left to others. The Public Library dates from 1852, the University from 1882. Liverpool is a typical commercial city, just as Manchester is the representative of industry.

MANCHESTER. Manchester existed in Roman times, when *Mancunium* was founded on the banks of the Irwell, a little feeder of the Mersey, on the habitable strip along the foot of the Pennines between the moors and the swampy lowlands. For long it was a little market town for its own valley, a local life-centre, and a place where the moorland weavers sold their produce. In the 14th century it imported Irish wool and traded in cloth. Later, it began to manufacture linen. Into this environment, where the art of weaving had already reached a high standard, cotton made its first appearance in 1641. England had been widening her commercial relations and had established direct contact with the Levant, Smyrna, and Cyprus, then the land of cotton. By giving a fine nap to a woof of linen, the Manchester weavers produced fustians which soon found a market throughout Europe and even in America. At the same time, owing to the trade with India, whose fine cotton textiles were much admired by the English public, the taste for cotton cloth spread through the country. Manchester undertook to satisfy the demand for it. About 1770, cotton had not only gained a secure footing, but had almost ousted wool. The removal of many wool weavers from Oldham to Bradford is recorded about 1780, by which time the number of cotton workers in and around Manchester amounted to some 30,000. Proximity to Liverpool was already assuring a world market for cloth made in Manchester.

Advantages of position caused Lancashire to gain supremacy in the cotton industry. Fast-flowing streams bring plenty of water-power from the hills ; hence, Arkwright's waterframe, which made cotton spinning into a great machine industry, was driven by water. Many factories were established in Lancashire valleys near to dams and mills, and by 1788 there were already more than forty spinning mills. When steam replaced water-power, the industry had at its disposal the resources of the extensive coalfields which lay almost at its feet. Lastly, the climate of the district favoured the prosperity of cotton manufacture. In too dry an atmosphere the staple is liable to snap under the strain of pulling and twisting, but on the damp hill-slopes, which were constantly saturated by mist and rain from the west, the work of spinning was at an advantage. This climatic advantage enabled yarns of a very high quality to be spun

and was certainly partly responsible for the monopoly enjoyed by Lancashire in the early days of the industry. Hence, owing to its proximity to a great seaport trading with the whole world, to its coalfield, its fast-flowing streams, its damp climate, and its long traditions of industrial skill, Lancashire soon concentrated in its area nearly the whole of the cotton industry of Great Britain. In 1838, it contained three-fifths of the cotton workers in the United Kingdom, and in 1925 it had rather more than three-quarters of their number.

With this cotton district another type of specialisation was not long in developing. From the end of the 18th century Lancashire was induced by the struggle with Continental rivals to concentrate the looms in steam-driven factories, so as to reduce the costs of production. First of all the industrial areas in the world it gave up the use of scattered domestic looms and adopted the practice of concentrating them in factories. In 1813, there were still 200,000 handlooms, but in 1856 only a few thousand survived, and in 1885 barely some hundreds remained. Today huge factories often contain more than 200,000 spindles or 2500 looms. This evolution in method was accompanied by the rise of a new type of worker, who acquired a high degree of skill, was very specialised and used to machinery, and who substituted delicacy of touch for muscular strength.

Concentration gradually led to an extreme division of labour and to specialisation in the successive operations required in production. Moreover, the Lancashire cotton district is so small that no work-centre is isolated, and each can specialise without fear of unemployment. Up to about 1790 London had been the chief cotton market, but in 1795 Liverpool took the lead. The cotton trade was organised independently of the industry, and for long years Manchester drew its supplies of raw cotton exclusively from Liverpool. Since the construction of the Ship Canal, cargoes of raw material have avoided the Liverpool market and have reached Manchester direct; but the former still maintains its supremacy, importing three-fourths of the raw cotton used in Lancashire and, by means of the age-long experience of its merchants, regulating purchases, stocks, sales, and distribution. The manufacturers of the district all rely on it for the supply of most of their raw material.

A striking degree of specialisation also exists in the industry itself. The same factory rarely engages in both spinning and weaving. Besides, these two branches of the industry have their special areas—spinning in the south around Bolton, Oldham and Rochdale, and weaving in the north around Preston, Blackburn, Wigan and Stockport—though neither operation is absolutely

excluded from the other's area. Even more remarkable is the specialisation of certain groups of factories on certain types of production. Thus, yarns of medium quality are produced around Oldham, Ashton, and Middleton ; and fine quality yarns around Bolton, Chorley, and Preston. In weaving, the specialisation is even more clearly defined : ordinary calicoes are made at Burnley ; cloth for sale in India and China at Blackburn, Darwen, and Accrington ; material made from dyed threads at Nelson and Colne ; fine light calicoes at Preston and Chorley ; velveteens at Oldham ; fine marcella and toilet fabrics at Bolton ; and expensive calicoes at Ashton-under-Lyne and Glossop. Many doubling mills are situated outside the main Lancashire textile area, in proximity to the yarn-using industries such as lace-making. This amazing division of labour, made possible by local conditions, is the essential result of the magnitude of the British cotton markets which cover the world.

After spinning, doubling, and weaving come the operations of bleaching, dyeing, and finishing, and these are all performed in different places. Bolton is the chief bleaching centre. Near all these cotton mills are other ancillary industries. Thus, dyes are made at Widnes and St. Helens, whilst textile machinery is produced at Oldham, Bolton, Bury, Accrington, Blackburn, and Burnley. Lancashire manufactures its own looms and exports them to every corner of the world where spinning and weaving are carried on.

The operations of manufacturing and selling goods are separated as completely as are those of purchasing the raw material and manufacturing it. Dealing in cotton manufactures, whether yarns or cloth, is centralised at Manchester itself. Throughout Lancashire the manufacturers throw on the merchants of Manchester the delicate task of securing purchasers, of observing fashions abroad, and of studying the progress of business in the world's markets. The Manchester Cotton Exchange fixes the price of yarns and cloth, and the manufacturer can go there any day to turn his produce into cash. He does not know whether it will be sent, for the wholesale merchants distribute it to the markets at their own risk. The wholesale houses are all in Manchester. The town has practically no mills, but has become a vast warehouse, a market, and a packing and despatching centre.

A few statistics will give an idea of the value of the Lancashire cotton industry to Britain. The annual consumption of raw cotton rose from 118,000 tons in 1830 to 983,000 tons in 1912 and 640,000 tons in 1937¹. The number of workers increased from 360,000 in 1820 to 625,000 in 1920, but by 1937 had fallen to 360,000. The value of the exports which in 1830 was £18,000,000 had risen in 1911-1913 to

¹This fell to 345,000 tons in 1944.

£113,000,000 and to £215,000,000 in 1918–1924. This figure represents four-fifths of the quantity of cloth produced. During the depression in 1931–1932 the industry was hard hit. In 1870, Lancashire consumed 53 per cent. of the world's production of raw cotton and contained two-thirds of the world's spindles ; but in 1934–1935 these proportions had fallen respectively to 10·3 per cent. and one-fourth. Nevertheless, up to 1939, Manchester continued to regulate the world price of cotton. In 1935, the industry employed 350,000 workers in Lancashire and the adjacent parts of Cheshire and Derbyshire, and the value of the production was about £140,000,000. Cotton was England's special source of wealth and the basis of her mighty reserves of capital, and is the most remarkable edifice of her commercial genius.

Around the industrial centres of Lancashire population swarms like ants. The 18th-century villages have now grown into large towns. In the Ribble valley there are Burnley (pop. 98,000), Blackburn (pop. 122,000), Accrington (pop. 43,000), and Preston (pop. 119,000) ; on the northern slopes of the Mersey valley are St. Helens (pop. 107,000), Wigan (pop. 85,000), Bolton (pop. 177,000), Bury (pop. 56,000), Rochdale (pop. 90,000), and Oldham (pop. 140,000) ; and around Manchester are Ashton-under-Lyne (pop. 51,000), Stalybridge (pop. 25,000), Glossop (pop. 20,000) Stockport (pop. 125,000), and Warrington (pop. 79,000).

Manchester, with its twin town of Salford, grew very rapidly from the end of the 18th century. Their united population was 20,000 in 1760, but rose to 95,000 in 1801, and to almost exactly a million in 1931. The vast town is gloomy and contains no trace of past history or of nature. The streams are fouled by refuse from the mills, and the foggy, smoke-laden sky gives little sunshine. The blackened countryside contains no drinking water, and, as the Longdendale reservoirs in the Pennines are no longer adequate, water is brought to the town from Thirlmere in the Lake District by an aqueduct 97 miles long. The great city conceived the ambition of becoming a seaport and, despite the hostility of Liverpool and of the railway companies, it constructed a ship canal leading to the navigable fairway of the Mersey. Opened in 1894, it runs from Manchester to the south bank of the Mersey near Eastham at a point six miles from Liverpool. It is nearly 36 miles long, and has a breadth of 120 feet at the bottom and a depth of 27 feet 9 inches. The total drop of 60 feet is overcome by means of five locks. It carries the head of ocean navigation 42 miles farther inland. Once the canal was opened, traffic began to use it more and more. In 1894, it carried 925,000 tons of shipping, in 1908 it carried 4,850,000 tons, in 1922 it carried 4,400,000 tons, and in 1936 as

much as 6,627,000 tons. The cotton cargoes, which are already equal to one-fifth of the quantity landed at Liverpool, have been followed by wood, wheat, petrol, wood-pulp, meat, fruit, iron ore, steel, kaolin, and even wool. Part of the merchandise arrives in transit and is distributed as wide afield as Yorkshire and the Midlands. However, Liverpool still retains its superiority by its geographical position, its long experience, its harbour equipment, and the variety of its cargoes ; for Manchester is without sufficient return freight for the ships which unload at its wharves. But even outside Manchester the Ship Canal is causing industry to spring up along its banks by attracting to them chemical works at Ellesmere Port and Runcorn, blast furnaces at Irlam, as well as mills and coal wharves at various points ; and it has become one instrument more in the hands of local industry.

Liverpool and Manchester, together with their suburbs and satellites, monopolise nearly all the business in Lancashire. Only a few towns in the north of the county maintain an independent existence. Lancaster (pop. 43,400), which was formerly the county town and was once a Roman station, has an old castle and a 15th-century church. Heysham and Glasson are two little ports which trade with Ireland. But Fleetwood, Blackpool (pop. 101,000), and Southport (pop. 79,000) lie within the sphere of influence of the two great cities. Fleetwood engages in fishery in the Irish Sea and supplies the city markets, whilst Blackpool and Southport are summer resorts for the swarms of workers on holiday.

The great industrial towns of South Lancashire may be said to form a single city which was the first to introduce into the world a new type of civilisation consisting of a society of workers, comfortably off and leading a full life, no longer a daily slave to the machine, but free in spirit, loving ease and liking travel, and always aspiring to a higher standard of living. This kind of society is the outcome of Britain's world relations and commerce. It gave rise to the theory of Free Trade, a policy which England championed throughout the world for a century. Cobden, the opponent of the Corn Laws, was a partner in a Manchester firm of cotton-printers. Lancashire's influence has passed beyond local and even national boundaries. Its large towns are as purely typical of English genius as Chicago is of that of the United States.

6. YORKSHIRE

On the eastern slopes of the Pennines industrial development has given rise to a whole swarm of towns which occupy a position corresponding to that of the cotton towns on the western slopes,

namely on the banks of the streams in the upland valleys and also at points where these valleys open out on to the plain (see Fig. 50). But in economic organisation there is not the same striking reliance on a single industry in Yorkshire as in Lancashire. Woollen goods are manufactured at Leeds, Bradford, Halifax, and Huddersfield, whilst steel is worked at Sheffield. Though the streams all empty into the Humber, overseas trade is not concentrated in a single

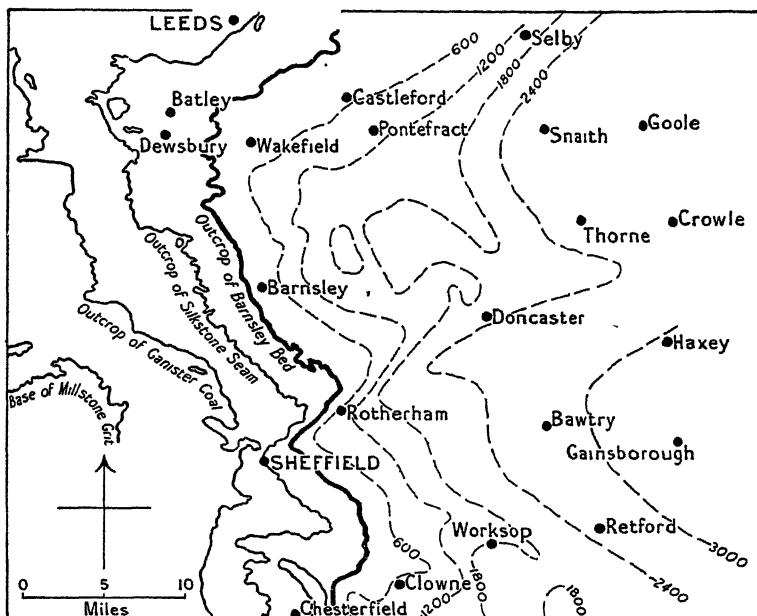


FIG. 53. The Concealed Coalfield of Yorkshire. (After Fearnside.)
The thick line marks the outcrop of the Barnsley Bed and of the basal surface of the Permian formation; the broken lines are approximate underground contours of the Bed as it dips under the younger strata farther east.

port. Hull and Goole divide the traffic between them, and even Manchester and Liverpool secure a profitable share in it.

The West Riding stands in nearly the same relation to the woollen industry as Lancashire does to the cotton. Its lead in the industry dates from the end of the 18th century, when the manufacture of wool migrated to Yorkshire from the eastern and southwestern counties. There it was in touch with Lancashire and its progressive district which had created the great cotton industry. West Riding supplied water power for the mills, clean water for washing the wool, and, above all, coal which was lacking in the eastern and south-

western counties. Between 1700 and 1801 the population increased by 136 per cent., and, later, between 1801 and 1851 it rose again by 132 per cent.

The woollen industry of the West Riding still retains features due to its migration to a modern industrial district. Of the two main divisions of the industry, the woollen and the worsted, the district excels in the latter, since this needs more machinery, more capital, and a greater division of labour than the former. The West Riding contains only two-thirds of the spindles and three-fifths of the looms in England which are engaged in the manufacture of woollens, and in this branch it has surpassed neither the Cotswold nor the Tweed district. But it retains, so to speak, a monopoly of the worsted section, since it contains all but 200 or 300 of the wool-combing machines in the United Kingdom and stands unrivalled in the spinning and weaving of worsteds.

The wool industry is carried on mainly in the upper parts of the valleys of the Aire and its feeder, the Calder, and is thus concentrated in the heart of the Pennines. Owing to the ease of communication across the mountains at this point, it even encroaches on the Lancashire slopes as far as Rochdale, where more than twenty-five factories produce flannel. In the West Riding it employs about 185,000 hands, not counting the 90,000 others engaged in the manufacture of cotton mixtures, in bleaching and dyeing, as well as in commerce. Inside this wool district some degree of localisation is noticeable, though it is less well defined than in the Lancashire cotton area. Generally speaking, it may be said that worsteds are manufactured in the west and north around Bradford, Huddersfield, Halifax, and Keighley; whilst woollens are made at Leeds, Batley, Dewsbury, Morley, and Rochdale. Batley and Dewsbury concentrate on cheaper fabrics composed largely of shoddy, whilst Halifax and Heckmondwike produce carpets. Within each of these localities a certain degree of sub-specialisation appears. Wakefield and Keighley are mainly engaged in spinning, Leeds in the production of ready-made clothing, and Bradford in commerce. In contrast with Lancashire, the West Riding does not have exclusive possession of the market for raw material, since raw wool from abroad is landed in London, Liverpool, Manchester, and Southampton, as well as at the Humber ports, and yarn and cloth are exported as much through Liverpool, London, and Dover as through Hull, Goole, and Grimsby.

Leeds and Bradford stand out as the principal towns in the woollen district. The former is situated on the Aire and lies in the belt of low hills which separate the Vale of York from the Pennine moors. It is an old cloth town and was prosperous as far back as

the beginning of the 18th century, when it had a greater population than Manchester. Subsequently, it grew more slowly than the great cotton town, increasing its population from 3,000 in 1801 to 483,000 in 1931. But it paid no more attention than Manchester did to architecture and town-planning. Apart from the main thoroughfare with its banks and insurance buildings, whose height and massive granite construction are not unimposing, the whole town, including the Town Hall and the cathedral, is gloomy and commonplace. Narrow, dirty streets lead to the industrial quarters, whose grimy ugliness stretches along the river bank. A great change has come over the functions of the town, for the trade in raw wool has almost wholly migrated to Bradford and, though there is still some weaving, the place is becoming more and more a vast workshop for the production of ready-made clothing to replenish the stocks of the large retail shops. The work is done either by machine under the control of English operatives in factories or else by indigent Jewish workers who work by hand on the domestic system. Before the 1931-1932 crisis 23,000 women were employed in Leeds, but only 12,000 men. The men who are not employed in textile industry are engaged in either transport services or metallurgical operations. The latter employ the majority, for Leeds has large engineering workshops, and there are blast furnaces and steel works in the suburbs of Hunslet and Armley. Here, as in Belfast, two industries combine in complementary fashion, one employing chiefly men, the other mainly women.

Bradford, which is situated in a little valley tributary to that of the Aire, was only a big village in the middle of the 18th century. By 1810 its population had risen to 13,000 and by 1821 to 26,000. Its growth did not really begin till 1830, when the development of mechanical wool-combing was instituted. The population then increased to 106,000 by 1861 and by 1931 it had reached 298,000. Bradford is the chief wool-combing town in the United Kingdom and contains 67 per cent. of the combing machines in the country. It manufactures expensive fabrics, high-grade worsted dress goods for women's wear, excellent cloth for men's suits and for upholstery, as well as velvets and plushes. Large factories engage in producing cloths in which cotton, silk, or mohair is mixed with wool. Saltaire, which is quite near to Bradford, manufactures alpaca. Owing to the keen business spirit which inspires it, Bradford acts as the headquarters of the industry. The wool brokers and the dealers in combed wool, yarn, and fabrics nearly all have their offices in the town, where two-thirds of the cloth manufactured in the West Riding is sold. Nowhere else is there such an enlightened understanding of the broader interests of the woollen industry. To ensure the

supply of raw material, the Bradford Chamber of Commerce began in 1859 to encourage sheep-raising in Australia, the Cape, and India and to introduce Angora sheep into South Africa.

Practically all the towns in West Riding are crowded within a radius of 15 miles of Bradford. They include Leeds (pop. 483,000), Keighley (pop. 40,000), Wakefield (pop. 59,000), Dewsbury (pop. 54,000), Huddersfield (pop. 113,000), and Halifax (pop. 98,000). These towns all bear the same family features : they sprawl over a large area, since each workman has his own home. The houses stand in endless rows, are all built on the same pattern, and have the same height and frontal appearance. In the smoky atmosphere they leave an impression of monotony and gloom. This picture is typical of the great industrial district of West Riding, which is now inhabited by more than two million people and has a density of 5200 persons to the square mile.

Sheffield is situated in Hallamshire at the confluence of the Don and Sheaf and lies at the bottom of an amphitheatre of hills. The continuity of the textile district on the eastern slopes of the Pennines is broken by its great steel industry. If some disaster were to destroy the works at Sheffield and force them to be rebuilt, a new position on the coast near the mouth of the Tees would probably be chosen, for the conditions which formerly determined the location of the industry no longer exist. In days gone by, Sheffield had all the requisite advantages. Ore was extracted locally from the Coal Measures ; large forests enabled charcoal to be produced ; swift-flowing streams gave plenty of water-power for blowing bellows and turning grinding-stones and supplied pure water for the tempering of blades ; local quarries yielded a type of sandstone whose hardness and fine texture rendered it peculiarly suitable for the whetting of steel ; and a coalfield had long been worked through galleries driven into the hillsides. These advantages gave rise to Sheffield's cutlery manufacture, whose produce figured even at the end of the Middle Ages in the exports from Liverpool to Ireland and for centuries has made the town famous all the world over. When local ore was no longer sufficient, Swedish iron was imported, and the town specialised more and more in the production of finished steel goods. In 1853, Bessemer invented and first applied at Sheffield a process which enabled steel to be made in bulk. From then on, local metallurgy depended more and more on raw material drawn from a distance, including ore from Lincoln, iron from Sweden, and pig from Middlesbrough. It restricted itself exclusively to secondary processes which required skill and turned out high quality goods. In 1936, Sheffield contained only four blast furnaces, but it had seventy-one steel works, producing 14 per

cent. of the British output. These works still manufacture knives, scissors, files, and axes, but they concentrate mainly on railway wheels and axles, looms, armour-plate, and weapons. Electroplating is carried on in addition to the preparation of special forms of steel. Sheffield's great store of technical experience compensates for the disadvantages of its inland situation, its distance from the sea, and the absence of a navigable waterway. The production of quantities of pig iron has been given up owing to the exhaustion of local ore ; but half-worked metal drawn from elsewhere is worked up into goods of superior quality by means of the skill of the craftsmen. Originally situated in an amphitheatre of green hills, the town now covers over the whole surface of this position with the monotonous ugliness of an industrial centre containing a population of 512,000 persons. The influence of its industrial activities extends over its smoke-riden, slag-heap-scarred neighbourhood to Ecclesfield and Rotherham (pop. 70,000), reaching southwards to include the metallurgical factories at Staveley, Chesterfield (pop. 64,000), and Alfreton.

After leaving the busy, teeming Pennine valleys, the Ouse, Wharfe, Aire, Calder, and Don make their way across fertile plains to the Humber and the North Sea. In these lowlands they flow through a number of old towns which are situated at wide intervals, each in the focus of its own agricultural district. The first to be encountered are modest places like Richmond on the river Swale, Knaresborough on the Nidd, and Ripon near the Ure, which, being situated at the mouths of the Pennine valleys, have for centuries provided a connecting link between moorland and plain. Ripon lies near the ruins of Fountains Abbey, a 12th century Cistercian foundation whose community was for long the greatest landowner in the district. In addition to these, there are Doncaster (pop. 63,000), which had been aroused from its mediæval quiet by the workshops of the former London and North Eastern Railway and by the working of its coal mines ; and Worksop (pop. 26,000), which boasts a ruined monastery, an old Gothic church, and some long-established agricultural industries. Next come the towns on the plain. These are market centres, some of which have been stirred from their tranquillity by the breath of modern industry that blows over the district and by the opening of a number of factories. They include Northallerton (pop. 4800), which is well known for its horse-fair ; Thirsk (pop. 12,000) ; Selby (pop. 10,000) on the Ouse, to whose large oil refineries and dye-works raw materials are brought by barge from Hull ; Beverley (pop. 14,000) ; Gainsborough (pop. 18,000) on the Trent, which manufactures agricultural implements. Newark (pop. 18,000), also on the Trent, is a little town containing

some castle ruins, a Gothic church, some old houses, a large market-place, and near the railway station a cattle market.

The historic cities of York and Lincoln act as centres for the



FIG. 54. The District round the Humber.

fertile plains which lie on either side of the Humber. York (pop. 84,000), which formerly stood at the head of the sea navigation of the Ouse, occupies a position on the ancient route from England to Scotland. The significance of its site has left its mark on the

history of the city. It began as the Roman colony and station of Eboracum and was more than once the residence of the Emperors. In the 7th century it became the seat of an archbishop, and, later on, it was a Danish colony and a Norman stronghold. Its splendid mediæval period survives in its minster and in the old walls which still enclose the most ancient quarter (see Plate XVC). The railway station lies outside the precincts of the city, for the bustle of modern life seems reluctant to intrude on the venerable town. The atmosphere of the whole place is one of peace and quiet, from the narrow, winding streets of the old quarters, the half-timbered houses over-hanging the streets (see Plate LVIA), the castle with its massive tower, and the various ruins to the many charming spots which breathe an old-world spirit.

Lincoln occupies a position similar to that of York, for it stands at the head of the navigation of the Witham at the junction of Foss Way and Ermine Street. The city, which now contains 66,000 inhabitants, was once the Roman station of Lindum and later was garrisoned by the Danes. At the Norman Conquest it held third place after London and York among English cities. Its ancient remains, including its 12th-century castle, its cathedral and other churches, and its 12th-century houses, are all grouped together on the hill which overlooks the gorge through which the river passes. The newer parts of the town are in the valley along the Witham and around the railway station. The city maintains its relations with the surrounding country, manufacturing farm machinery for it and holding fairs and markets for the sale of its grain and stock.

Along the sea coast is another series of towns. Some, like Saltburn, Whitby (see Plate XXIXB), Scarborough (pop. 42,000), Bridlington, Hornsea, Withernsea, Cleethorpes, Sutton-on-Sea, and Skegness, are seaside resorts which may be regarded as appendages of the inland towns, since they live by taking in the crowds of industrial workers in the summer holidays. But on the Humber there are also busy towns which serve the industrial backland (see Fig. 54). These are Hull (pop. 313,000), Goole, and Grimsby (pop. 92,000). Over a long stretch of coast extending from the Tees to the Thames, the Humber is the only inlet by which ocean-going vessels can approach the great industrial district of the West Riding. The fan-shaped arrangement of the rivers which flow into the Humber opens the way in many directions through the mountains and over the plains. From the 15th to the 18th century navigation on the Ouse, Aire, Calder, Derwent, and Trent was steadily improved, and large cargoes of grain passed down them to Hull, for shipment to the Netherlands. The port then acted as a point of transhipment from barge to ship and *vice versa*, and it drew its trade from as far

afield as York, Sheffield, Lincoln, Nottingham, and even Lancashire by way of the upper Trent. After the Industrial Revolution and during the 19th century this original function was swelled by all the traffic resulting from the growing manufacturing centre in the West Riding. The position of Hull on the outer side of a bend in the broad estuary ensured a good depth of water off the port. To counteract the 20-foot range of the tide, the construction of wet docks was undertaken in 1807, and the number of these has steadily increased with the needs of the port. In 1922, nine million tons of shipping entered or cleared from Hull, a figure which places the town sixth in order among the ports of Britain. Its main function consists of the importation of foodstuffs for the Yorkshire towns, and, consequently, it resembles London in having a great excess of imports over exports. Among the latter are coal, machinery, steel goods, and cotton and woollen yarn and fabrics. It imports wool indirectly through London, whilst it receives foodstuffs directly from the Continent, oil-seed for the factories in Selby (to which it is taken in barges) or in Hull itself, pitprops, and corn for distribution to the flour-mills in the district. Whilst Liverpool trades with the whole world, Hull deals particularly with the countries on the North and Baltic Seas and on the English Channel. Goole, near the head of the estuary, is a little port for coastwise shipping. Its outward cargoes consist of coal, the inward ones of foodstuffs.

Along with this shipping trade on the Humber goes another seafaring occupation, namely, fishing. The situation of the ports between the fishing banks in the North Sea and the swarming populations of the inland districts raised the occupation to the status of an important industry. Its prosperity here goes back to the middle of the 19th century, when fishermen hailing from Brixham and Ramsgate came from the Channel waters to trawl in the North Sea and found some extraordinarily rich grounds, particularly the Silver Pits which were discovered in 1845. Settling at Hull, they initiated the trawling industry in the North Sea. But to reach that port the boats were forced to sail upstream for 25 miles in an estuary dangerous on account of fog. Hence, when the railway to Grimsby was built in 1859, the trawlers took to landing their fish at that place. Gradually, Grimsby became the world's largest fresh-fish port. The railway company which constructed the harbour works made excellent arrangements not only for landing, selling, and despatching the fish by express trains, but also for supplying the boats with water, ice, and coal. The interval between the landing of the fish and its despatch by train has been reduced to a minimum. Every evening special trains take the catch to London, Birmingham and other Midland towns, Manchester and Liverpool,

Yorkshire, and Scotland. At the height of the season, between 250 and 300 special trucks leave Grimsby daily. This organisation of the industry, which has helped to make fish one of the cheapest and most widespread articles of food in Britain, is part and parcel of the economic system of the North of England, where every activity is affected by the industrial spirit. Both farmers and fishermen work to supply urban markets, and the growth of the towns has led to the intensive exploitation of land and sea.

7. THE DISTRICT ADJOINING THE MIDLANDS

The Pennines die away abruptly towards the south into the low plains drained by the Trent and Weaver. From early times the district lying at the foot of the mountains here has been studded with towns, for it is a focus of routes which cross, pass along, or run round the Pennines. Viewed from the North, it forms a kind of vestibule to the Midlands. It guards the natural route along which the strongholds of Nottingham, Derby, Stafford, and Chester were built in the Middle Ages. But these old towns have neither fallen behind the times, as so many others have done, nor come to the end of their careers. Proximity to the coalfields, good communications by rail and water, and in some cases the survival of an ancient industry have favoured their revival and growth. The same advantages, together with the exploitation of mineral wealth formerly neglected, have given rise to a number of new towns which have rapidly developed in the Potteries and the salt-bearing district of Cheshire.

Nottingham (pop. 269,000) stands on the Trent at a point where the river leaves the Midlands to enter the Humber district. Its position had great strategic value in times past, a value which was enhanced by the actual site. On the red sandstone hill, which is honeycombed with caves and commands the low ground near by, were built first a British settlement, then a Danish and Saxon fortress, and later the Norman castle which was destroyed during the Civil War in the 17th century. Whenever warlike operations have occurred in England, the place has been regarded as the key to the Midlands. The market-place which stands in the centre of the town, with its old houses whose upper storeys overhang the street and are supported on pillars, is a reminder of the commercial function of the town as a focus for the fertile district around. Modern industry has now completely taken hold of it. It began to manufacture textiles after the introduction of machinery, and from the end of the 18th century it has specialised in cotton hosiery. This is still its main occupation, though it also produces machine-

made tulles, lace, and embroidery similar to those made in Chemnitz, Plauen, Saint Gall, and Calais. The yarn comes from Lancashire and the West Riding. The fuel, however, is found almost on the spot, for the coal mines in the Erewash and Leen valleys are situated in the northern outskirts of the town. Near these factories are others which have been attracted by the presence of labour and the advantages of the position. These manufacture embroidery frames, motor cars, chemicals (Boot's), tobacco (Players), and bicycles. Hence, near the town and fusing with it to form a single industrial unit is a swarm of little places like Lenton, Basford, Greasley, Beeston, and Radford, which are all satellites of Nottingham.

Derby (pop. 142,000), which is situated in the Derwent valley at a point where the river reaches the plain, also owed its growth to its geographical position. It commands the road to the richest lead-bearing district in the Pennines, and up to the 18th century large quantities of the metal passed through the Derby market before reaching London. In troublous times the town and its castle guarded the route from the Midlands to Lancashire through the Pennine valleys and also the communications in the plain. With Lincoln, Leicester, Stamford, and Nottingham, it was one of the Five Boroughs won from the Danes in the 10th century by the King of Wessex. It functioned solely as a county town and as a life-centre for its district until the industrial movement overtook it. The first silk factories in England were established at Derby in 1718, and from that time the town has continued to make textiles, hosiery, lace, and silk goods. At Belper, a short distance north in the valley of the Derwent, is one of the few centres of cotton-spinning outside Lancashire. The Rolls-Royce Company produces its famous cars and aero-engines at Derby. The old strategic importance of this town survives in its railway junction, where several main lines converge. Here, British Railways (London Midland Region) have their locomotive and carriage works, employing more than 10,000 men. A little to the west of Derby, other towns sharing in the textile industry are situated at the mouths of various Pennine valleys. These are the silk-manufacturing town of Macclesfield (pop. 35,000), which is well known for its sewing-silk and dyed silk goods, and its satellites of Congleton and Leek (pop. 18,000).

In contrast with Nottingham and Derby, which rely on skill for the production of fine textiles, are the towns which deal with heavy material extracted from the earth, the salt and pottery towns which form two special new types that have sprung up in the valleys of the Weaver and upper Trent. The Triassic beds of the Cheshire plain contain at depths varying between 200 and 500 feet two layers of salt, each more than 100 feet thick, stretching from Nantwich to

near Lawton. Judging by the occurrence of the suffix *-wich* in a good many place-names in the district, the salt must have been worked in early times. The Romans knew of the salt springs in the locality, and Domesday Book mentions brine-pits at Droitwich. In the 14th century loads of salt were being sent by boat to Bristol. But the salt then derived from the district was obtained by the evaporation of water from salt springs. In 1670, the beds of salt in the deep-lying strata were reached by pitshafts, and regular mining began. In the 18th century salt figured among the chief exports from Liverpool, where it was shipped to India and the United States. Today it is sometimes used as ballast for ships sailing to India. But the mining and preparation of eating-salt is now the least important of the processes connected with these valuable beds, for a great number of chemical industries based on them have sprung up in the Weaver basin. Large factories at Northwich, Winsford, and Middlewich produce soda, and the green countryside bears the dirty and untidy marks of industry in its smoky chimneys, its tall pumping frames, and its broken surface. The development of these factories would have been impossible but for the existence of waterways needed for transporting heavy materials like salt, limestone, coal, pyrites used in the production of sulphuric acid, and oil-seed required by soap works. The Weaver has been canalised and forms the very busy highway for this traffic. By enabling the salt to be carried cheaply to the coal wharves on the banks of the Mersey and the Manchester Ship Canal, the stream has helped the chemical industries to move near to the coal. Pipelines also carry the brine pumped up from the salt mines. Thus, a whole row of big chemical and soda works, hydrochloric acid factories, glass and soap works are crowded along the banks of the estuary at Widnes, Runcorn, Weston Point, Bebington, and even in the suburbs and neighbourhood of Liverpool.

In the North Staffordshire coalfield, not far from the source of the Trent, there is another industrial area with a number of towns placed so close together that they may be regarded as a single concentration with a population exceeding 350,000 persons. The chief are Stoke-on-Trent, Hanley, Burslem, Longton, Tunstall, Fenton,¹ and Newcastle-under-Lyme. The name Potteries indicates the special industry of the district. Beds of clay contained in the coal measures had been used from time immemorial for the manufacture of ordinary earthenware. The population consisted of primitive potters working on the domestic system. The district was off the main routes and infertile. But in the 18th century, when the growth of industry brought about the construction of

¹ These six are now combined in a single County Borough.

canals by which raw material might be transported into the area, and a number of technical inventions carried to perfection the process of glazing, the use of moulds, and the application of colours, the district developed into a manufacturing centre unparalleled in the world for the production of ceramics, earthenware, and porcelain. In 1769, Wedgwood founded near Hanley his great 'Etruria' factory which soon became famous for the delicacy and good taste of its work. There too he began the manufacture of drainpipes and water-conduits which at once found an immense market in the English countryside, where intensive cultivation had wrought great changes. Now the Potteries supply the whole world with elegantly decorated porcelain, finely modelled vases, table crockery, paving-stones, floor tiles and slabs for public and private houses, earthenware, coarse pottery, pipes, tiles, and bricks. The district is the main centre of the baked clay and ceramic industry. An abundant supply of coal is the basis of this great activity, since every ton of output consumes in some cases more than five tons of coal. Hence, it has been possible to import raw material which the district is without or of which its supplies are exhausted. Blue clay is brought from Devon and Dorset by way of Teignmouth and Poole, kaolin from Cornwall and Devon, gypsum from the neighbourhood of Derby, and silica from the south of England. For the transport of these heavy materials the Trent and Mersey Canal connects the Potteries with Liverpool and the Mersey, and this port distributes the manufactured articles over the four quarters of the globe. This is a further illustration of the fact that the industrial wealth of the North of England does not lie solely in the exceptional abundance of coal, but also in the existence of easy means of communication and of established centres of commerce.

Both the Pottery towns in the Trent basin and the salt towns in the Weaver valley are situated on the edge of the plains which lead from the Midlands to the estuaries of the Dee and Mersey, and they have taken advantage of the possibility, due to the low-lying nature of the district, of constructing canals for the transport of heavy goods. But this local traffic is only a part of the great stream of trade which has for centuries passed through the Cheshire Gate, for the low ground between the Pennines and the Welsh mountains forms a natural route along which communication between England on the one hand and Scotland and Ireland on the other has always moved. In modern times the railway junction of Crewe (pop. 46,000) has grown up around the station, where six main lines cross; and the London Midland and Scottish Railway (Northwestern Section) has enormous workshops in the town for the construction

of locomotives and carriages. These works employ over 20,000 men.

But the oldest focus of routes in the district is Chester. The city was founded by the Romans, who used it as a fortress to keep the Welsh in check. The site is worth examining. It consists of a red sandstone hill which rises 100 feet above the surrounding plain and was formerly girt with a protective belt of swamps, forest, and quicksands. Situated at the lowest point at which the tidal portion of the Dee afforded firm banks, it formed a port for communication with Dublin. Added to all this, it was in the neighbourhood of the rich lead and gold mines in Wales. The town declined with the power of Rome, but it revived when the Norsemen who had settled in Ireland and the Isle of Man selected the Dee as their highway into the Midlands. In the Middle Ages Chester became a seaport with widespread trade with Ireland and the Continent. It began to decline once more when the gradual silting of the Dee diverted traffic to the Mersey and Liverpool. At the present day the town, which has a population of 41,000, has not regained the status it held in Roman times and in the Middle Ages. Yet it retains in its outward appearance picturesque scenes which recall its past history, including its old walls which have now been turned into a promenade, irregular streets which have been in places cut in the bed-rock, old wooden houses with half-timbered façades overhanging the streets, the peculiar 'Rows' consisting of footpaths along the first-floors of the houses, and a beautiful Gothic cathedral of reddish sandstone. Chester has recently altered greatly; it is now modernised, busy, and up-to-date, and it has factories which have been built well away from the centre of the city. Not far distant are Ellesmere Port with its flour mills, Sandycroft with a foundry, Queensferry with a shipyard, and Saltney and Connah's Quay with some petrol refineries.

8. THE ISLE OF MAN

The Isle of Man lies in the Irish Sea halfway between Ulster and Cumberland. It measures about 30 miles in length and 10 miles in breadth. Its area of 228 square miles is greater than that of the Isle of Wight, but less than that of Anglesey. Separated from Ireland by a trough 70 fathoms deep, it is connected geographically with Britain. Though it is only 17 miles from the coast of Scotland and 32 from that of Cumberland, its geographical connexion is with the latter rather than the former, for an undersea ridge submerged by only 15 fathoms connects it with the adjoining English coast, whilst the Triassic rocks of the plain at its north end bear a strong geological resemblance to those of the shores of the Solway Firth.

The island is formed of very hard Cambrian schists which geologists connect with the schists of Skiddaw in the Lake District. Its resistant mass, which is pierced by eruptive dykes and granitic intrusions, yields a relief much like that of the mountains of Cumberland and Scotland. It includes uplands which rise in Snaefell to 2034 feet; deep, picturesque valleys, or 'glens,' carved in the uplands; and along the coast majestic stretches of cliff broken by ravines and overhanging rocks and enclosing little rocky bays of transparent water. The surface of the uplands is smooth and gently undulating and is covered with heather, dwarf reeds, and in places with peat. This topography shows that the island is a detached portion of the mainland of Britain. The likeness in the scenery is completed by the traces of the ice ages, which are visible in both. These include morainic forms and deposits of drift in the low-lying north end of the island and raised beaches around the Point of Ayre.

But the island contains characteristics of its own. It does not consist entirely of upland, for the whole of the northern end is a flat, low plain, 46 square miles in extent, whose surface is raised here and there by hillocks of glacial origin. Moreover, the uplands themselves do not form a compact block, but are cut in two by a transverse valley running from Douglas to Peel. The main highway of the island which follows it crosses from coast to coast without rising more than 180 feet above the sea. A remarkable difference exists between the windward and leeward sides of the island, for the leeward side, being sheltered from the west winds, has a rainfall of barely 25·5 inches and enjoys conditions of sunshine and insolation which in districts farther south do not occur north of the coasts of Devon. This situation has safeguarded agriculture and prevented stock-raising from invading the whole country, as it has done on the English lowlands opposite. The Manxman has remained faithful to the plough and the cultivation of oats. Arable still occupies the astonishing proportion of four-fifths of the total utilisable area and is distributed among small-holders. On the other hand, flocks of sheep have from time immemorial been grazed on the upland moors. In the hills near Foxdale and Laxey lead and zinc are mined, but the lodes are gradually becoming exhausted.

In spite of all this, the soil would be unable to support a population of 49,000—217 persons to the square mile—did the sea not afford another source of wealth. No other part of the world contains so high a percentage of fishermen among its population, for the Manx are a truly seafaring people. Consequently, more than half the population is concentrated along the coast in the fishing villages and little towns, of which Douglas (pop. 19,000), Ramsey (pop.

4500), Peel, Castleton, and Laxey are the chief. The bold and enterprising fishermen usually catch herring in the Irish Sea ; but from June to October they set off in search of mackerel off the south coast of Ireland. Here they come into contact with others from Cornwall, Scotland, and Brittany. Their long experience in the art of navigation has evolved a peculiar type of boat and rig. The close association of coastal scenery with its admirably blending colours attracts hundreds of thousands of summer tourists and visitors from the industrial centres in Lancashire, Yorkshire, and Scotland. Douglas is four hours by steamer from Liverpool and three hours from Fleetwood and Heysham.

CHAPTER VIII

WALES

WALES is a mountainous peninsula and forms part of the upland belt which occupies the west of Britain. Remote, wild, and rugged, these uplands are stamped with features resulting from the hard ancient structural rocks, from the massive uniform outlines due to age-long denudation, and from the block-uplift movement which started another cycle of erosion and gave rise to valleys. These valleys were further boldly gouged by glaciers which in Wales contributed almost from the 1000-foot contour features that in the Alps would scarcely be found until the 7000-foot contour had been passed. Wales itself offers man nothing but vast expanses of bare moorland, except in the valleys, whose shelter permits the existence of trees and cultivation, and on the coastal plains, where there are stretches of fertile soil. It is situated in the remote west and is largely surrounded by sea. But its valleys open out towards the east and bring it into close relation with the English plain. Hence, it was forced at an early period into the political orbit of England.

Wales measures 140 miles from north to south, 120 miles from east to west across its widest part, and 40 miles across its narrowest portion. With Monmouthshire, it has an area of 8006 square miles. In 1801 it contained a population of 590,000, and this had risen to 2,593,000 in 1931. In the former year it contained, therefore, one twenty-seventh of the population of the United Kingdom, and in the latter year one seventeenth. Certain likenesses suggest a comparison with Brittany, which, however, is larger and contains a greater population.¹ But, whilst the density of population in Wales amounts to 323 persons to the square mile, in Brittany it is 249. The fact is that, in spite of the great industrial activity of South Wales, the peninsula as a whole differs from Brittany in its more mountainous character, in its more northerly situation, which has exposed it to glacial action, and in its greater isolation, whereby it was for long cut off from the main stream of maritime life.

1. RELIEF AND UTILISATION OF LAND

Wales is a block of uplands formed of ancient rocks and separated from the upland areas of England by the plains of the Severn, Dee,

¹ Brittany has an area of 13,039 square miles and contains a population of 3,250,000.

and Weaver. The tops of the hill, as seen from the highest points within the mountains, exhibit a surprising regularity, and the land-

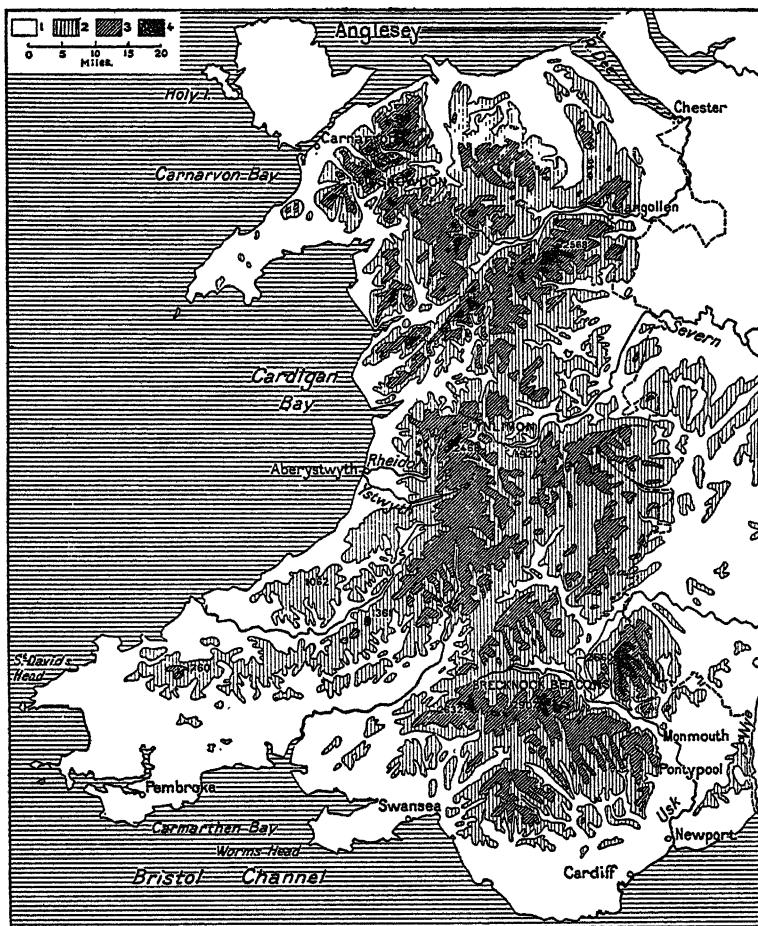


FIG. 55. Relief of Wales.

1. Areas less than 500 feet above O.D.
2. Areas between 500 and 1000 feet above O.D.
3. Areas between 1000 and 2000 feet above O.D.
4. Areas over 2000 feet above O.D.

scapes, as in other upland districts in Britain, convey an impression of regular surfaces, smooth outlines, and undulating moorland alternating with wide valley bottoms. But as they leave the moun-

tains these valleys cut through the plateau in picturesque gorges and reach the plain through rocky defiles like those of the Dee near

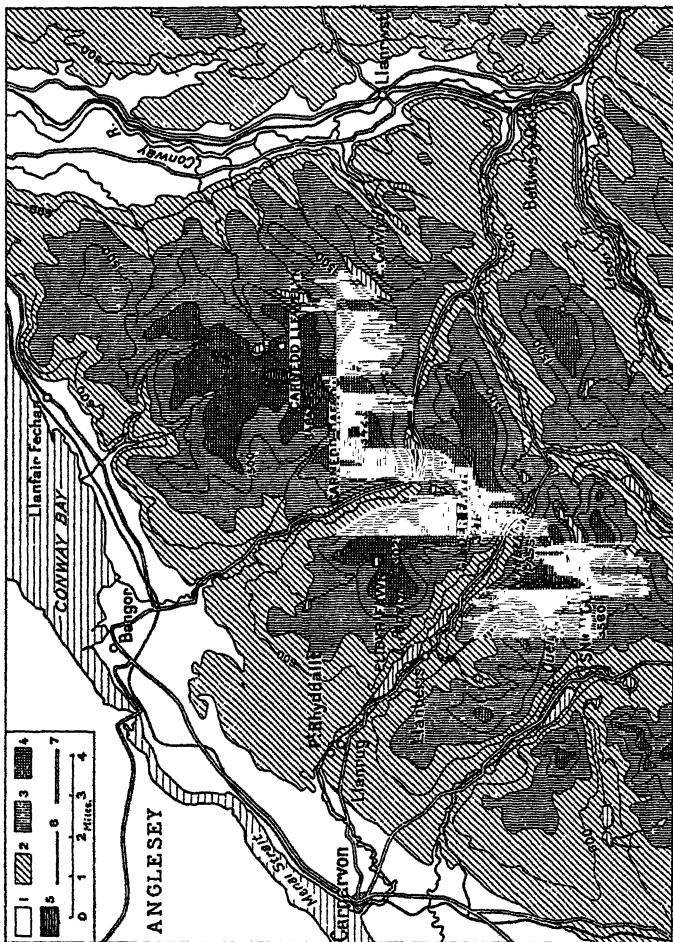


FIG. 56. The Snowdon District.

1. Areas less than 300 feet above O.D.	4. Areas between 2000 and 3000 feet above O.D.
2. Areas between 300 and 1000 feet above O.D.	5. Areas over 3000 feet above O.D.
3. Areas between 1000 and 2000 feet above O.D.	6. Railways.
	7. Roads.

Llangollen, the Rheidol to the east of Aberystwyth, or the Wye above Monmouth.

In the detail of the relief there are a number of conspicuous features which as a rule owe their origin to ancient glaciers. These agents are indeed responsible for all the bold, striking, and wild characteristics in North Wales. Glacial topography is found as far south as Plynlimon, the beautiful valleys of the Rheidol and

Ystwyth, and on the Brecon Beacons. But the glacial scenery of the Snowdon district is unrivalled in the perfection of its beauty. Even at relatively low altitudes the scenery is that of a mountain district. Local glaciers once descended from Snowdon to the valleys of the Nant Ffrancon, Llanberis, Afon Gwyrfai, Nantlle, Glaslyn, and Conway, and moved along the coast and across Anglesey to join the ice-stream which occupied the Irish Sea. The whole surface of Anglesey has been planed by ice into a series of corrugations running north-east-southwest. The long depression of Malldraeth Marsh, which ends in a bay on either side of the island, occupies a trough with glacial features ; and the Menai Strait appears to have been affected by the same factors. The relief of Snowdonia has resulted from the deep incision of four large and two small corries in an originally more rounded mountain (see Plate XXXIVa). Some of its summits still retain small areas of flattish surface, but only the skeleton of the former slopes remains on its sides. Between the corries stand knife-edge ridges, some of which are scarcely wide enough to bear a footpath. The ridge on the north side is wider and carries a rack-and-pinion railway from Llanberis to the summit. The valleys radiating from Snowdon are striking examples of the glacial valley and contain all its characteristics. These include rock-dams through which the streams have cut gorges ; wide terraces containing peaceful tarns, lakes like Padarn and Cwellyn, whose clear water is fringed with *roches moutonnées* : lateral valleys which fall in abrupt ravines into the main valleys ; marshy valley-bottoms and peaty grassland in which the foot sinks at every step ; and terminal moraines forming the wooded heights occupied by the park of Penrhyn Castle near Bangor and by the villages of Llanrug and Pont Rhyddallt. The valleys all penetrate into the Snowdon *massif* and, meeting at their upper ends, form long, low, steep-sided passes which allow of easy communication between the valleys. The high-road from England to Ireland crosses the Llanberis Pass at the low elevation of 1169 feet, passing between ridges more than 3000 feet high (see Fig. 56 and Plate XXXIII). The perfection of glacial forms on Snowdon reaches its highest degree at a still lower altitude in the Cwellyn valley, where at a height of 500 feet the scenery is of an almost Alpine character, even in the neighbourhood of the parks, cultivated land, and magnificent woods near Caernarvon.

One of the points of likeness between Wales and Brittany is their peninsular character ; but Wales is wilder and more rugged, forming as it does one of the areas of high moorland which are part of the normal landscape of the west of Britain. Heather and poor grass cover nearly two-thirds of the country, except in the two counties

of Flint and Anglesey, where it occupies less than 10 per cent. of the surface. Like other mountain districts, it does not encourage agriculture, but is better suited to pasturage. Only 16 per cent. of the surface area of the country is arable, as against 44 per cent. under permanent pasture. Throughout, grass covers a greater area than cultivation, and it occupies more than half of Anglesey, Flint, and Pembrokeshire. In Carmarthenshire the proportion rises to three-fifths. Even the arable land is little used for cereals. Only four counties, viz. Pembrokeshire (12 per cent.), Anglesey, Cardiganshire, and Flint, devote more than 10 per cent. of their arable to corn crops. Furthermore, the commonest cereal is oats, wheat being almost wholly neglected. The rest of the arable is given up to crops needed for feeding stock, viz. roots and artificial fodder. This explains the essentially pastoral appearance of the Welsh countryside.

The utilisation of the land shows local differences which are as well marked as the local differences in topography. The barren stretches of mountain, moor, pasture, and waste contrast deeply with the fringe of fertile valleys and plains which form a rich girdle round the uplands. On the coast lie fertile strips along the Menai Strait and the Bristol Channel, whilst inland are the sheltered valleys of the Wye and Teme, in which rich pastures and orchards abound.

The mountainous character of the scenery is due less to elevation than to the appearance of the vegetation. The utilisation of the uplands is wholly dominated by the fact that the upper limit of trees and cultivation is astonishingly low. Woodland is scarcely ever found above the 1000-foot contour, whilst above the 600-foot contour there is little cultivation. The upper limits of trees and cultivation is lowered by the poverty of the soil, the strength of the wind, the coldness of the climate, the abundance of rain clouds, the low degree of insolation, and great expanses of peat. The surface has a mountainous appearance at elevations at which crops flourish in less maritime districts in the same latitude. Wales is a land of monotonous moors, of large expanses of heather stretching as far as the eye can see and broken here and there by bilberry bushes, reeds, bracken, and coarse grasses. Moorland covers the hill-tops and slopes with its greyish mantle. Beds of peat through which little streams have cut black furrows occur nearly everywhere, whilst here and there the soil is replaced by piles of stones and bare boulders (see Plate XXXIII).

The only areas of fertile soil among the uplands occur on the river terraces and alluvial tongues in the narrow, ribbon-like valley-bottoms. Agriculture gives poor returns, for corn ripens late, and the length of the winter season hinders work in the fields. Cultiva-

PLATE XXXIII



[Photo. Hudson.

THE LLANBERIS VALLEY IN NORTH WALES

A typical U-shaped valley with a rocky surface and two ribbon-lakes.

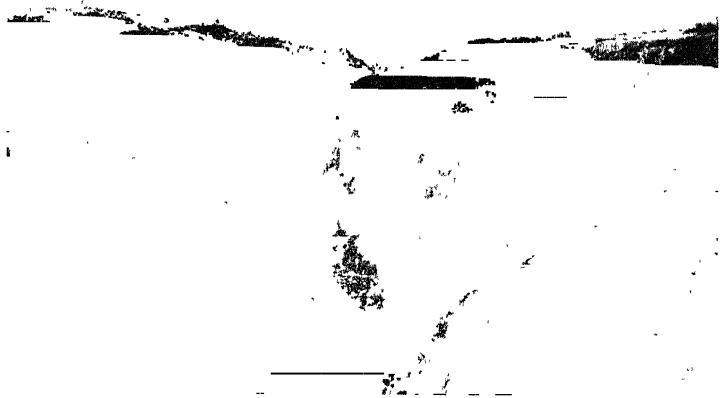
PLATE XXXIV



[Photo, Maclardy, Oswestry.]

A. A CWM AND TARN IN SNOWDONIA

The corrie is situated on the north face of Glyder Fawr, and the tarn, Llyn Idwal, drains into Nant Ffrancon.



[Photo: Picture Post.]

B. THE RHEIDOL NEAR DEVIL'S BRIDGE, CARDIGANSHIRE

A gorge which has been eroded in the plateau since the end of the Ice Age.

tion has always been a secondary occupation. In the Middle Ages the Welsh ate little bread, but lived chiefly on milk, butter, and cheese. Pastoral occupations formed the basis of their livelihood. When English land-surveyors assessed the land in the 14th century, they found that landownership consisted of pasture rights held in common by a certain number of families over large stretches of land. The area was divided into summer and winter pastures. In summer the shepherd lived in his *hafod-ty*, or hut among the hills ; in winter he went down to his main dwelling (*pentre*), which was built on a sheltered spot down in a valley. This seasonal movement of population has almost ceased now; but that of sheep goes on, and the pastoral life continues. The whole mountain area forms a vast pasture subdivided by dry-walls. Here thousands of sheep are turned out to graze. The walls do not reach to the tops of the mountains; but these unenclosed upper areas are also used in summer by the flocks, and the mountain wall separating the enclosed from the unenclosed land is a great feature in many parts. Around the houses in the valleys are meadows from which hay is cut for the winter. Sometimes milch cows are kept, and in the southwest there is a hardy breed of little horses famed for their strength and steadiness. But the sheep is the commonest animal on the hills and moors. Its wool has been from earliest times woven in scattered cottages and in the villages. Few districts in England contain so many sheep to the acre as do the Welsh counties. In Brecon and Denbigh there are 113 animals to every 100 acres, in Merioneth 105, in Radnorshire and Montgomery 112, and in Caernarvonshire 88.

The seasonal migration of the sheep enlivens the mountain solitudes. At one time of the year flocks may be seen leaving the valleys to spend the summer on the high moors, whilst at another season they move down from the inland districts to spend the winter on the coast. In some cases they travel from Brecon and Radnor or from Carmarthen towards the coast of Cardiganshire ; in other cases they pass down from northern Caernarvonshire to Portmadoc, Criccieth, and the vale of Clwyd. Many of the upland farms have flocks of sheep which are sent to the valleys for the winter on a boarding-out system. This is a relic of the old days of the *hafod*, and it is interesting that the upland farmer is often the main sheep-owner, whilst the lowland farmer merely looks after them for the winter. Many yearlings which have been fattened in Radnor Forest end their wanderings in the rich Shropshire pastures.

The upland areas are still a land of smallholders whose little farms are worked by their families. The prevailing system of tenure is neither that of the large English farm which tends to be run on commercial lines, nor that of the dwarf holding which exists

in some parts of Ireland; but comprises a modest farm which generally suffices for the support of a family and seldom calls on labour from outside the family circle. When labourers are employed, they live the same frugal, simple life as the farmer does. Fresh meat does not appear on the table every day, and in some remote districts the diet consists mainly of milk and oatmeal porridge. Life is rougher and the houses less comfortable than in England. It is still possible to find kitchens unfloored with either wood or brick and with big chimneys up which the sky can be seen. Old customs have died hard, and even at the end of the 18th century the cottages were still built by the communal labour of neighbours. In the valleys round Plynlimon and Snowdon social gatherings still take place on winter evenings round the peat fire. The countryfolk are quite poor, and formerly many of the more indigent used to migrate at harvest time to Herefordshire, Denbigh, and even Middlesex; but since the middle of the 19th century this exodus from the hills has until recently been directed mainly towards the industrial district of South Wales.

The mountains of Wales are encircled by strips of fertile land comprising the coastal lowlands and the wide valleys which open out on to the eastern Marches. One of the smallest, but most clearly defined, occupies the Clwyd valley, a valley which has been filled with relatively soft rocks covered with glacial drift. The escarpments of carboniferous limestone which overlook it are pitted with caves. This district, which focuses on the town of Denbigh, devotes a greater area to wheat—more than 2 per cent.—and rears more pigs than does any other part of Wales.

The plain which includes part of Anglesey and the shores of the Menai Strait opposite is far larger and is surfaced with glacial clay. Its fertility caused it to be known in the Middle Ages as 'the mother of Wales'; and in the 12th century Giraldus Cambrensis remarked that it was capable of supplying wheat enough to satisfy the needs of the whole peninsula. Its conquest by the English in 1276 put an end to the resistance of the mountain folk. Although it produces a great deal of oats and turnips, its main source of wealth is no longer cultivation, for it has been won over to pastoral occupations; and now it looks just like a piece of English countryside. Stone walls and hawthorn hedges cross it in all directions, whilst shelter is provided by fine specimens of ash, elm, and oak. Most of the enclosed fields are under grass, some of which is used as hay for feeding large numbers of cattle. It contains a greater proportion of these beasts (15 in every 100 acres) than any other county in the United Kingdom. Many of the farms produce butter, whilst others supply eggs and poultry to the coastal towns.

On the shores of the Bristol Channel there is another plain which includes part of Glamorganshire and one end of Pembrokeshire. Its open, low-lying character, its fertile soil, and mild climate make it excellent for habitation and agriculture. Man has dwelt here from very early times, and many megalithic remains survive in the peninsulas of Pembroke and Gower. The English used it as a route by which they closed in round the mountains and held the Welsh in check by means of castles built here. Flemish colonies were planted in it by the kings of England ; and from as early as the 12th century it has been a 'little England beyond Wales.' The fertility of its soil is indicated by its early development and its density of population. Up to the 18th century it produced wheat, but since the Industrial Revolution it has turned into pasture land. The fields, which are enclosed by hedges and trees, yield grass. Its two ancient breeds of cattle, the black Pembrokeshire and the Glamorganshire beast with its brown coat streaked with white, have both been improved through crossing with English breeds and give milk of excellent quality. The whole district, from Pembroke to Newport, forms—so far as it has not been invaded by factories—an immense pasture ground which furnishes the industrial area with milk and butter.

The broad eastern face of the slopes of the Welsh mountains overlooks the wide curve of the Severn valley and is entered by several broad vales. The foot of the uplands is here fringed with a pleasant and attractive strip of country, the Welsh Marches, in which gently sloping, wooded hills separate verdant little plains formed in the softer layers of the Old Red Sandstone. The surrounding country is somewhat rugged in its relief. To the south rises the steep, wooded plateau of the Forest of Dean ; to the east the moor-crested ridge of the Malvern Hills ; to the west the rough slopes of the Black Mountains and Radnor Forest. But in the heart of the Marches—in the valleys of the Wye, Lugg, and Teme around Hereford, Leominster, and Ludlow—extends a wide stretch of woodland which is one of the freshest, greenest, and richest parts of the west of Britain. The Old Red Sandstone decomposes into silty earth, whilst in the valleys the soil contains lime and is often very deep. The slopes are sheltered from the Atlantic storms and enjoy abundant sunshine and warmth in summer. There is no sign of drought and bareness, as there is in some parts of East Anglia. The trees are magnificent, especially the oaks ; and hedges make a show of green everywhere. Whole forests of fruit trees grow in the shelter of the dells. The district is one of gentle rises and hollows, which give it variety and shelter, and its leafy woodland hides the great wealth of its fertile soil, its fields of wheat, oats, barley, and turnips,

its luxuriant meadows and pastures, its apple orchards, and its hop-fields. The farms all keep a good deal of their land under grass, for grazing cattle of the Hereford breed. These animals are thickset, yield a great weight of beef, and are famous for the ease with which they are fattened. The local farmers boast that Herefords fatten on pastures where Shorthorns die of hunger. This attribute causes young Herefords to be much sought after by the graziers in the Midlands, who buy them in order to fatten them for sale to the slaughter-houses. Many of the animals have been shipped overseas and now form part of the herds on the Prairies and Pampas of America.

No district in England grows more fruit than Herefordshire and the western portion of Worcestershire. Apple trees are planted, as they are in Normandy, among the growing crops and in the pastures. Excellent varieties of apple yield the cider which is the ordinary drink of the farmers. It is a traditional beverage, for old records of the 17th century contain lists of the best brands. There are also cherry and plum trees, between whose regular rows shelter raspberry and gooseberry bushes and sometimes strawberry frames. Hops are cultivated in the Teme and Lugg valleys. The rural character of the Welsh Marches, which rival Kent in being the chief fruit-growing district in Britain, prevents them from having sufficient labour for the harvest ; hence, workers are called in from the industrial conurbations of the Black Country. These people put up in huts or tents and work at the harvest for a short period. As soon as the fruit is picked, they return to their ordinary life in the towns invigorated by the fresh country air (see Plate XXXVI).

2. TOWN LIFE

Apart from the industrial district in the south, all the towns in Wales are on the coast or the valley-plains. The coast of the peninsula with its difficult communications does not lend itself to maritime life ; hence, outside the coalfield there are no large seaports within its confines, though Liverpool and Bristol lie just beyond the border. On the landward side, towns have grown up at points of contact between upland and lowland, as well as near the centres marking the line of contact between the English and Welsh.

Between Anglesey and the mouth of the Dee the towns are all on the coast or quite near it. Flint (pop. 7600) is a county town, but should, on account of its chemical industries, be regarded as lying within the sphere of the coalfield of N.E. Wales. Denbigh (pop. 7200), which is also a county town, is an old place with some castle ruins ; St. Asaph is a quiet cathedral town ; Rhyl (pop. 13,500) a seaside

resort. Llandudno (pop. 14,000), another seaside resort, lies on a narrow peninsula near the magnificent cliffs of Great Orme's Head and affords a wonderful view of the Welsh mountains.

The northwestern corner of Wales (see Fig. 56) witnessed the historic strife between the English and native Welsh and contains many concrete survivals of the struggle in the form of castles. Conway (pop. 8700) is still girt with walls and commanded by its 13th-century castle (see Plate XXXVB). Bangor (pop. 11,000), a bishop's see, contains a cathedral which, having often been damaged in the fighting, was rebuilt in the 15th and 16th centuries. It also has a university college which has led research into the history, language, and literature of Wales. Beaumaris in Anglesey was built as a stronghold by Edward I; and Caernarvon (pop. 8400) is a fortress-port with narrow, winding streets and a 13th-century castle (see Plate XVI) which is one of the marvels of English military architecture in the Middle Ages. But the wealth of the district does not lie wholly in its legacies of the past, for its soil is fertile, its slates are being worked, and the high-road to Ireland passes through it. The largest slate quarries in the United Kingdom are situated at Bethesda near Bangor and at Llanberis near Caernarvon. The hillsides are scored by enormous amphitheatre-like excavations in the Cambrian shale fronted with gigantic terraces. The quarries employ thousands of men in the extraction and finishing of roof-slates which are despatched to all parts of the Kingdom. The district is so close to Ireland that across it passes one of the main highways of Britain. The crossing from Holyhead, a ferryport on a little island to the west of Anglesey, to Dublin is a distance of only sixty miles, and the journey takes two and a half hours. Anglesey itself is separated from the mainland by the Menai Strait, which is a partially silted valley rather than an arm of the sea, being only two hundred yards wide at one point. It is crossed by two bridges which are high enough to allow small vessels to pass under them. The graceful suspension bridge built by Telford in 1821-26 is crossed by the highway to Holyhead. This ferryport has grown into a town of 10,000 inhabitants. Beyond the little rocky bay, which forms a natural harbour, a breakwater nearly a mile and a half long has been built to form a deep-water shelter.

From Caernarvon round the coast of Wales to the Bristol Channel there are only little towns of local importance, most of them being summer resorts and tripping centres, like Criccieth, Portmadoc, Harlech, Barmouth, and Dolgelley (see Plate XXXVA). Aberystwyth is a pretty place with 9000 inhabitants, which in the 16th, 17th, and 18th centuries was the outlet for the lead, copper, silver, and zinc mines in its backland. Situated on an estuary which is shared by

the Rheidol and Ystwyth, it stands at a point where in very ancient times the route along the Severn valley reached the coast. In the 6th century Christianity was preached nearby at Llandabarn Fawr, and a castle was built on the present site of the town in the 13th century. Under this castle grew the town, which to-day is mainly a seaside resort, though its university college has a high reputation for its researches in Welsh matters and problems of pastoral agriculture, and the National Library of Wales is situated here.

Of the other little towns which occur along the coast, Cardigan is a quiet place of 3300 inhabitants ; Fishguard, a ferryport connected with Rosslare ; St. David's, at the end of an isolated peninsula which is exposed to the Atlantic blasts, is a mere village of 1000 souls, though it is a bishop's see and contains in its 12th to 16th century cathedral the finest historic building in Wales. The little towns of Haverfordwest (pop. 6000), Pembroke, and Milford Haven stand on the shores of the magnificent ria of Milford Haven, which penetrates nearly twenty miles inland. Pembroke (pop. 12,000) was a fortress in the 12th century and still contains the well-preserved ruins of its castle. Today there are shipbuilding yards in its outport at Pembroke Dock. Milford Haven (pop. 10,000), where it was once intended to build a naval base, has through the efforts of the Great Western Railway Company become a port at which fish is landed for rapid transit by special trains to Birmingham, London, Liverpool, and Manchester. Tenby (pop. 4100) is a seaside resort perched on a rocky headland between two wide sandy beaches. Carmarthen (pop. 10,000), an ancient Roman station at the mouth of the Towy, is a county town which long acted as an outlet for the lead mines behind it. Llanelli lies within the industrial district of South Wales.

On the eastern border of Wales most of the towns lie in the valleys along the line of contact between upland and lowland. Abergavenny (pop. 8600) on the Usk has been, like other towns in the district, in turns the site of a Roman station (*Gobannium*), a Norman stronghold, and a Benedictine abbey. It is a pretty place with hilly streets and is surrounded by wooded heights. A little farther downstream is Caerleon, the *Isca Silurum* of the Romans and the legendary seat of King Arthur. Along the Wye is another line of old towns. Hereford (pop. 24,000), an outpost of the English conquest and a cathedral town sheltered by many lofty trees, is a residential place whose peaceful atmosphere is disturbed only by the passage of farm waggons through its streets on market days. Ross (pop. 4700) has an old church and a picturesque bridge over the Wye ; Monmouth (pop. 4700), another quiet little town, has the ruins of a castle, an ancient bridge over the Monnow, and a

PLATE XXXV



[Photo: Lupton, Bradford.

A. THE MAWDDACH VALLEY NEAR DOLGELLEY IN MERIONETHSHIRE

This is one of the beauty-spots in Wales.

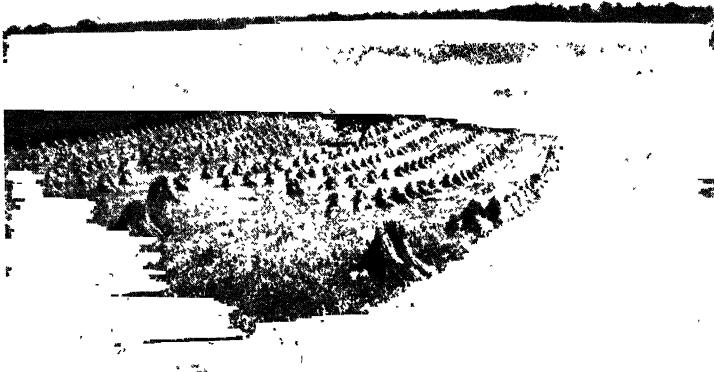


[Photo: The Times.

B. CONWAY CASTLE

[To face page 234

PLATE XXVII



[Photo: A. Demangeon.]

A. THE COUNTRYSIDE NEAR LEDBURY, HEREFORDSHIRE
In the background the Malvern Hills are silhouetted against the skyline.



[Photo: Ballard, Chepstow.]

B. THE WYE VALLEY NEAR SYMOND'S YAT, MONMOUTHSHIRE

Norman chapel ; and Chepstow at the mouth of the Wye is an old stronghold on the historic Marches where the English and Welsh struggled for long years.

Before entering the Severn estuary, the Wye skirts the south-western edge of the rocky slopes of a little wooded plateau known as the Forest of Dean. The forest of oaks which used to flourish in this curious district has escaped the deforestation that has been going on for centuries in the country, though the oaks have largely been replaced by coniferous plantations of larch and fir. The forest occupies an area of 18,600 acres. Mingled with the conifers are copses of ancient oaks and beeches and magnificent clumps of holly. Before coal was used to smelt iron ore, these trees supplied the fuel burnt in the smelting-works. Mention is made of furnaces and forges in the district as early as the 12th century. Up to the middle of the 18th century iron from the Forest of Dean had a high reputation ; but the working of the beds of ore, which lie in irregular pockets and are very variable in their yield, was abandoned when, in the 19th century, the iron industry began to exploit more convenient sources. Now practically no iron from the Forest of Dean goes to the tinplate works at Lydney, which use steel, and steel is not made in the Forest of Dean. Lydbroke makes cables for the electrical industry. At Cinderford and Steam Mills engineering is still carried on ; it grew from the local iron and was based on castings. It made engines for the local coal mining industry, but is now restricted to various minor articles just a little too complex for a local blacksmith. Coal forms the main source of wealth in the district. The coalfield on the plateau is much smaller than that of South Wales, but resembles it in the arrangement of its beds. The strata dip inwards in a basin-like manner ; but on the whole the district rises above its surroundings because its upper strata rest on resistant layers of millstone grit and carboniferous limestone. The Forest of Dean coalfield comprises 35 square miles, and under the whole of this area lie coal measures 2600 feet thick and containing some fifteen seams which are worked down to a depth of 900 feet. The mines are free from fire-damp, but often suffer from the seepage of water. The pit-heads are right in the wood, and the work, carried on almost in the shade of trees and amidst vegetation, escapes the gloomy surroundings of the Black Country. Between one and one-and-a-half million tons of coal are raised annually, the whole of it being sent to neighbouring regions, including Gloucester and the West Midlands, as well as to Bristol and South Wales. The miners dwell on the verge of the Forest in a ring of little towns like Lydney, Cinderford, Coleford, and Mitcheldean.

The change of gradient at the foot of the hills north of the Forest

of Dean is marked by a line of towns. Of these Malvern (pop. 15,000) is a curious collection of villas, hotels, schools, and health baths, standing on the slopes of the Malvern Hills. Leominster (pop. 5700) has grown up around a 7th-century monastery. Ludlow (pop. 5600) on the Teme has a 12th-century castle and is a market for agricultural produce. Still farther north there are in the upper valley of the Severn the market towns of Welshpool (pop. 5600), Montgomery, and Newtown (pop. 5000).

Near the point at which the Dee leaves the mountains there is a densely peopled little fringe of country, situated on a discontinuous line of outcrops of coal. This is the coalfield of North Wales, which stretches from near Wrexham to the estuary of the Dee and lies partly in Flintshire and partly in Denbighshire. The ground is

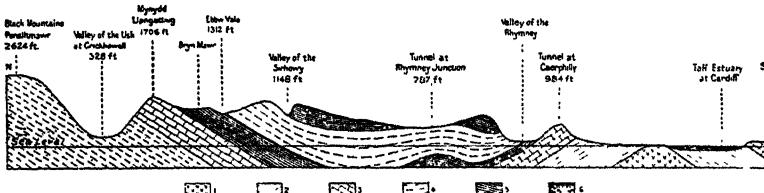


FIG. 57. Generalised Section from North to South across the South Wales Coalfield from the Black Mountains to Cardiff.

- | | |
|--|---|
| 1. Silurian. | 4. Pennant Sandstone separating the upper from lower coal measures. |
| 2. Old Red Sandstone. | |
| 3. Carboniferous Limestone and Millstone Grit. | 5. Coal Measures. |
| | 6. Triassic and Jurassic beds. |

pitted with holes and covered with heaps of slag and excavated rock, whilst the sky is black with smoke. There are little towns like Llangollen (pop. 3000), a market town and tourist centre which is inside the mountain area, and Oswestry (pop. 9700), a larger market town. Ruabon, Wrexham, and Rhos are the chief centres of population in the coalmining district, and there are rayon factories near Flint and Holywell. But the larger towns, the historic cities of the Marches, are right out in the Midland Plain and include Chester, the ancient port on the Dee, and farther south Shrewsbury, the fortress on the Severn.

3. THE INDUSTRIAL DISTRICT OF SOUTH WALES

The existence of a rich coalfield along the shores of the Bristol Channel from Newport to Llanelli has given rise to a teeming population in the valleys which break the uniformity of the mountain slopes in South Wales. About the middle of the 18th century coal was worked at Merthyr Tydfil and distributed by pack-horse as far as Brecon and even Herefordshire; but it was used for

domestic purposes only. Large-scale mining dates from the time when coal began to be used for smelting the ore which abounded in the district. From that moment began the development in South

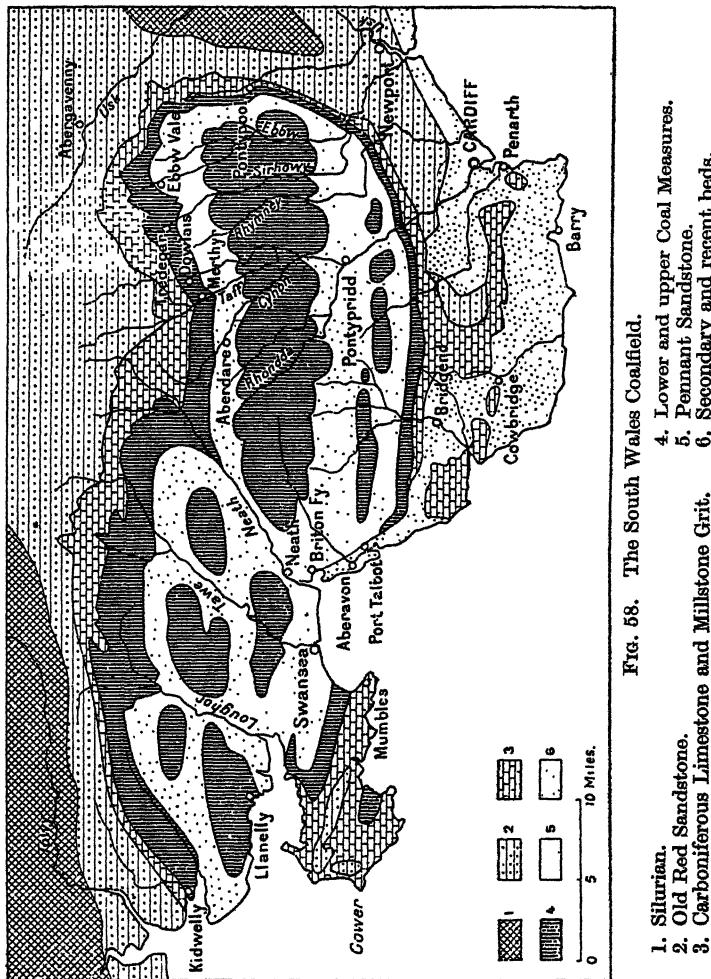


FIG. 58. The South Wales Coalfield.

1. Silurian.
2. Old Red Sandstone.
3. Carboniferous Limestone and Millstone Grit.
4. Lower and upper Coal Measures.
5. Pennant Sandstone.
6. Secondary and recent beds.

Wales of Britain's youngest industrial district. Its coalfield is, next to that of the Clyde, the most extensive in the United Kingdom and covers some 7900 square miles. It is shaped like an oval trough with its long axis running east-and-west over a length of 75 miles from St. Bride's Bay to Pontypool (see Figs. 57 and 58). Its width

varies from 12 to 15 miles. The sea has penetrated it through two large inlets, Carmarthen and Swansea Bays, which allow ships to sail within near reach of some of the mining centres. The region is a high plateau dissected by many valleys, the chief of which are those of the Afon Lwyd, Ebbw Fawr, Ebbw Fach, Sirhowy, Rhymney, Taff, Cynon, Rhondda, Neath, and Tawe. The valleys not only form ways into the heart of the coalfields, but also natural

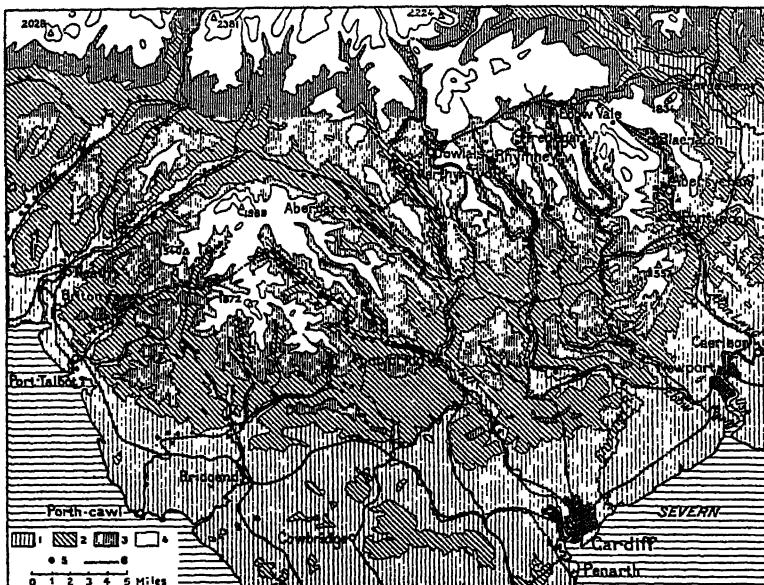


FIG. 59. The South Wales Coalfield, showing relief, railways, and coalmines.

- | | |
|---|---------------|
| 1. Areas less than 300 feet above O.D. | 5. Coalmines. |
| 2. Areas between 300 and 800 feet above O.D. | 6. Railways. |
| 3. Areas between 800 and 1250 feet above O.D. | |
| 4. Areas more than 1250 feet above O.D. | |

cuttings which enable the outcrops of coal to be worked on their slopes. For years the sinking of expensive shafts was avoided by driving galleries into the sides of the valleys, and this method is still employed to the northwest of Newport at Cwmbran, Henllys, and Machen. Transport of the fuel to the ports is rendered easy by the railways which run down the valleys (see Fig. 59).

A striking change in the character of the coal occurs as one goes from east to west. In the east and northeast the district begins with bituminous coal which yields good domestic fuel and excellent coke.

The presence of coking-coal together with iron ore explains the early development of metallurgical industry around Merthyr Tydfil and in the Taff valley near Cardiff. In the centre of the basin, in the valleys of Merthyr Tydfil, Aberdare, and the Rhondda, the coal is mainly semi-bituminous. As it has great heating qualities and gives little smoke or ash, it was much sought after for use in steamships and formed the Welsh steam-coal which was formerly renowned throughout the world. Finally, the northwest of the field yields anthracite of excellent quality, but difficult to work on account of the dislocated nature of the beds.

Between 1931 and 1939 the annual output of the South Wales coalfield was about 35 million tons, but in 1945 the output was only 22 million tons. Previous to 1924 it was more than 50 millions. Between 1873 and 1913 production rose by 250 per cent.; in 1913 the mines employed nearly a quarter of a million workers, but this figure fell by 40 per cent. between 1923 and 1936. Owing to its abundance and variety, Welsh coal was still exported in enormous quantities up to 1939. Previous to 1913 steam-coal was shipped as far as Singapore and Shanghai; but by 1935 it did not go beyond the Indian Ocean. Yet the volume of exports was still great. It rose from 3,500,000 tons in 1873 to 20,925,000 tons in 1903, and to 36,780,000 tons in 1913; but fell to an annual average of 22,000,000 tons between 1927 and 1931. During the war years 1939-45 all export ceased, but it began again on a small scale in 1946.

By a coincidence, which has been noticed above as occurring in Scotland also, iron ore is found interposed between the beds even of the lower coal measures. From the very first the field was worked far more along its northern outcrops, because there the strata are less tilted and are richer than those in the south. Accordingly, from the middle of the 18th century the iron industry was concentrated in the northeast near the abundant ore and coking-coal found in the neighbourhood of Merthyr Tydfil, Dowlais, Rhymney, Tredegar, Pontypool, and Ebbw Vale. But as Welsh ore was unsuitable for making steel, it was given up from the middle of the 19th century and replaced by foreign, and especially Spanish, ore. Owing to industrial inertia, the blast furnaces remained in the northeast at Ebbw Vale, Blaenavon and Dowlais, and at Cwmbrân in the southeast; but others were established on the coast where foreign ore was landed; and the steel works also tend to cluster along the coast. Hence, the metal works have moved from inland positions towards the shores of the Bristol Channel. Much of the steel produced in the western establishments is used in the tinplate industry, which is the most characteristic industry in Wales. Established at the beginning of the 18th century at Pontypool, three-quarters of it are now con-

centrated within a radius of twelve miles of Swansea, but the modern Richard Thomas strip mill is at Ebbw Vale. Before the world depression it contained about sixty factories with some 370 mills employing more than 20,000 hands (see Fig. 60). The tin, which was formerly supplied from Cornwall, now comes from Malaya, Bolivia, and Nigeria. Other metals, besides iron, are treated in works at Swansea. The copper industry located between Port Talbot and Llanelli employs 3000 hands; zinc works employ 1000; and nickel, which is refined at Clydach five miles north of Swansea, employs 3100 hands.

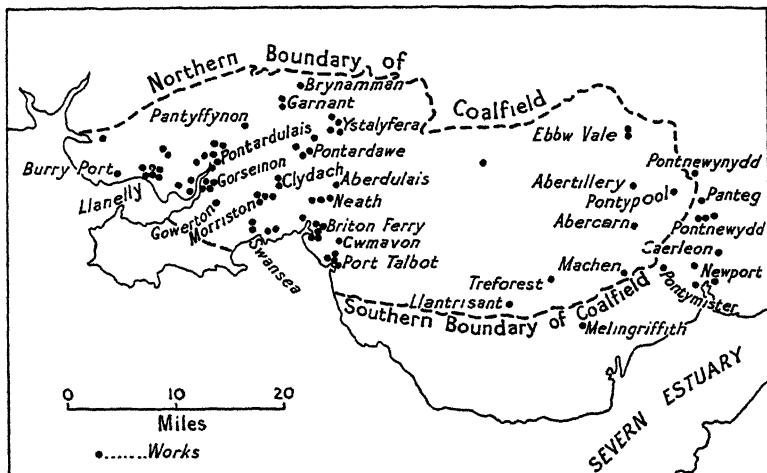


FIG. 60. Tinplate, Sheet and Galvanising Works maintained in 1936. (After D. Trevor Williams.)

The needs of the coal-exporting trade and the importation of raw materials, ore, and foodstuffs of all sorts have given rise to large seaports. The trade of Cardiff, Swansea, and Newport may be summarised as consisting of the importation of foodstuffs, ore, and wood and the exportation of coal and metal. Newport is mainly a creation of the 19th century. In 1792, its population numbered only a thousand, but this increased to 67,000 in 1901 and to 89,000 in 1931. Its harbour is formed by the mouth of the Usk and is four and a half miles long by 350 yards wide. At high water in spring tides the water is 39 feet deep. Three large docks have been constructed on the river banks and have been equipped with the most up-to-date apparatus for loading and discharging cargo. Iron ore and wood form more than half of the imports, whilst coal forms more than nine-tenths of the exports. Swansea (pop. 165,000),

which is on the estuary of the Tawe, began to export coal earlier than did the other Welsh ports, for records mention it as early as the 14th century. In the first half of the 19th century it developed its coal trade more slowly than Newport and Cardiff, owing to the difficult navigation of its harbour. Breakwaters had to be built along the fairway, and docks had to be constructed. Thirty years ago ores formed 80 per cent. of its imports. Today the metal works in the town mainly use concentrates of copper, nickel, and zinc (or spelter), as well as scrap-iron, wasters from the tinplate mills, and imported pig-iron or even imported steel bars. Coal and metal form 94 per cent. of its exports. Briton Ferry and Port Talbot belong to the same coal-exporting unit. But Swansea differs from its fellow ports in its intense activity in metallurgical industries and contains tinplate, copper, nickel, and zinc works. Shipyards and railway yards increase still further the swarm of workers in the town and its suburbs. Not long before the 1939-45 war, the Anglo-Iranian Oil Company built enormous installations for the refinement of oil, which has come into use as fuel for steamships.

Cardiff (pop. 224,000) dates from the 19th century. In 1801, it had only 1840 inhabitants. During the 18th century and at the beginning of the 19th it was the port from which iron produced in the Merthyr Tydfil district was shipped. In 1798, the two towns were linked together by the Glamorgan Canal, which in 1819 transported 46,624 tons of iron and 34,606 tons of coal. In 1849, this tonnage had risen to 156,000 and 247,000 respectively, for coal had even then assumed first place in the trade of Cardiff. In 1810, a tramway had been added to the canal and, with this development, the coal trade increased enormously. In 1870, 3,111 000 tons were exported, and in 1913 this increased to 34,213,000 tons, the cargoes being sent mainly to France, the Mediterranean countries, and South America. The town became famous throughout the world for its smokeless steam-coal. Its harbour, which is formed by the estuary of the Taff, contains six large docks, the first of which dates from 1829. Their maximum depth ranges from 28 to 41 feet. To this huge port must be added the subsidiary docks at Barry, which were constructed in 1889 in order to relieve the congestion of the coal trade at Cardiff. The two ports together form an enormous coal wharf which specialises in the export of coal. The 123 miles of the Taff valley railway lines is one of the largest coal-carrying routes in the world. Before the 1939-45 war, coal formed four-fifths of Cardiff's exports, the imports being mainly cereals, wood, and ore. The commercial functions of the town, which are very simple at present, are tending to develop. Even as late as 1914, Cardiff depended on London, Liverpool, and Bristol for its foodstuffs. Since

the town had to pay the middlemen in those ports for transport and commission, it has begun to import directly and is making an effort to become a distributing centre for the whole of South Wales. Hence, it has recently developed an enormous flour-milling industry.

The depression of the 1930's greatly affected Cardiff's coal trade. Foreign competition had reduced its export of fuel in 1924 to 11,060,000 tons, and coal has been replaced by crude oil for use as fuel in large vessels. The shipping and metallurgical industries were similarly affected. Unemployment followed the depression in the main activities of the town, which has therefore been forced to develop its commercial functions and to establish the newer industries of paper-making, printing, etc. Nevertheless, it still remains essentially one of the main centres of the coal trade.

The expansion of coal mining and industry which took place in the last century caused a great increase in population and transformed what had been formerly waste or agricultural land into an urban area. Between 1801 and 1931 the population of Glamorganshire increased from 78,880 to 1,226,000, the latter figure giving a density of 1500 persons to the square mile. But this by itself gives no real idea of the density of population. The valleys which lie between almost uninhabited plateaus, and are literally crowded with people, sometimes afford so little space between their steep sides that a stream, a road, and a railway just fit into them. In this narrow space and on the steep slopes the machinery and installations connected with coal mining struggle for room with the thousands of little stone houses in which the miners dwell. In the Rhondda urban area there are 4450 persons to the square mile, and in Mid-Rhondda this number rises to 6700.

The growth of population took place extraordinarily quickly. The population of Cardiff rose from 1840 in 1801 to 18,000 in 1850, to 60,000 in 1870, to 165,000 in 1901, and to 224,000 in 1931. Since 1841 the population has increased by 10,000 with every million tons' increase in the export of coal. The population of Barry rose from something like 100 in 1881 to 13,000 in 1891. This furious expansion has left its mark on the unfinished development of the towns. Merthyr Tydfil (pop. 71,000), for instance, long gave the impression of being an enormous unplanned, smoke-blackened town ; it is now decaying. Coal towns like Aberdare (pop. 49,000), Rhymney, Dowlais, and Pontypool, Gelligaer (pop. 41,000), and Pontypridd (pop. 43,000) are all alike in their poverty and ugliness. Others, like Neath (pop. 33,000) and Llanelli (pop. 38,000), have increased through the needs of industry and are either factory centres or railway junctions. Bridgend not only became a railway junction for the mining valleys of the Llynfi, Garw, and Ogwr, but is now

to be the site of one of the largest munition factories in South Wales. Cowbridge remains a market town. The whole district has been affected by industrialisation, and even the rural areas regulate their production so as to meet the needs of the towns for foodstuffs. All relics of the past have been destroyed, and old buildings have disappeared under the pressure of modern requirements. The countryside itself has been blasted, and cinders from the furnaces and heaps of shale slag from the coal mines rise up in barren hillocks. On the hills near Swansea poisonous gases from the factories have caused both grass and trees to die and have thus produced a kind of desert. But the coast of Glamorganshire near Llantwit Major and fragments of the plain of Glamorgan near the old market towns of Cowbridge and Bridgend, together with the Gower Peninsula and portions of the Vale of Neath, retain a good deal of their natural beauty. There is also the possibility of the development of this coastal zone as a playground and tourist area.

CHAPTER IX

THE SOUTHWEST OF ENGLAND AND THE CHANNEL ISLES

THE southwest of England, or the West Country as it is often called, comprises the counties of Somerset, Devon and Cornwall, and part of Wiltshire, and consists of a narrow peninsula which separates the Bristol and English Channels. It is joined to the rest of England by a low isthmus little more than 30 miles in width. It is mainly composed of a mass of ancient rocks, and bears a strong family likeness to the upland areas in the west of Britain. It is more of a peninsula, less mountainous, and more exposed than Wales. On a relief map it appears as an alternation of little *massifs* and depressions (see Fig. 61). The uplands are arranged in two discontinuous belts, one in the north comprising the Mendip and Quantock Hills and Exmoor (1708 feet), the other in the south including the Blackdown Hills, Dartmoor (2039 feet), and Bodmin Moor. The depressions form the main river valleys. Two large streams, the Exe and the Tamar, which rise near the Bristol Channel, flow southwards along the most ancient drainage lines. Another pair, the Taw and the Torridge, flow through a kind of longitudinal trough between Dartmoor and Exmoor. A third group drains the low plain in the east and includes the Parrett, Brue, Yeo, and Avon, which all empty into the Severn estuary. The alternation of hill and valley, of upland and lowland, does not result, as it does in Scotland, in isolated compartments of difficult access, and there is no natural fortress, no defensive work to shelter a recoiling people. Hence there are no survivals of the Celtic language in Devon or Cornwall, as there are in Scotland and Wales. Nevertheless, owing to the peninsular nature of the region the Celtic tongue survived longer here than in the plains of the west Midlands. To the west of the Tamar Celtic place-names are plentiful, and a Celtic dialect was still spoken at the beginning of the 17th century in several of the parishes near Land's End. The last person to speak the ancient tongue was a woman who died near Penzance in 1778. But these relics of the past are disappearing, and English influence is pervading the whole region. Devon and Cornwall are rescued from isolation by their essentially maritime outlook. Their situation on the shores

of the Narrow Seas and of the Atlantic Ocean and the presence of a large number of harbours and estuaries between Start Point and

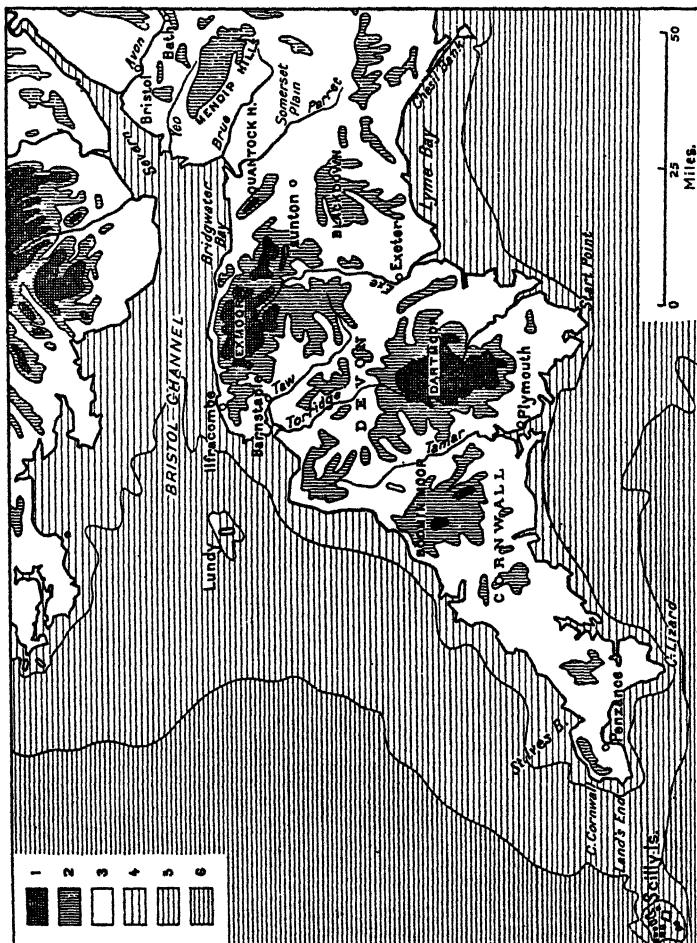


FIG. 61. The Southwest of England.

1. Areas more than 1000 feet above O.D.
2. Areas between 500 and 1000 feet above O.D.
3. Areas less than 500 feet above O.D.
4. Depth of water between 0 and 20 fathoms.
5. Depth of water between 20 and 40 fathoms.
6. Depth of water greater than 40 fathoms.

Land's End draw them seawards and make human life in them wholly dependent on the sea.

1. SCENERY AND RURAL LIFE

The long peninsula comprises two quite different parts. The westernmost consists of a plateau of Primary rocks—schists and

sandstone dominated by granite heights—which tapers out into the sea. The easternmost is a low plain resting on soft beds of Trias and Lias rocks, and is a true extension of the English Plain. The hilly plateau of Devon and Cornwall is related to the older and more mountainous districts of the west of Britain, whilst the scenery of the Plain of Somerset resembles that of the English Midlands.

RELIEF. The Plain of Somerset stretches along the Bristol Channel in a low, submerged strip which is as flat as the surface of a pond. In its natural state its lower-lying portions were occupied by the large peat bogs of Kenn Moor, Turf Moor, and Sedgemoor. But drainage operations, begun centuries ago, have created the artificial landscape proper to reclaimed areas, and the scenery is marked by long straight ditches, or ‘rhines,’ which are full of sluggish water and afford a passage for flat-bottomed boats; lines of pollarded willows with grey, wrinkled bark; geometrically regular fields bounded by narrow strips of green; and here and there a willow brake. Around these peaty alluvial bottoms, which cover some 250 square miles, stand gently undulating plains consisting of Liassic and Triassic marls and clays, whose enclosed pastures, orchards, and oak and hazel copses call to mind the scenery of the Midlands.

In north Somerset steeper and bolder forms appear when the ancient rocks, which consist mainly of carboniferous limestone, outcrop through the plain. The hills thus formed are visible traces of the Hercynian structure which lies buried under younger rocks. A resistant belt of this limestone formation has been sawn through by the Bristol Avon at the narrow Clifton gorge (see Plate XXXVIIIA) and may be seen also along the coast in the cliffs near Portishead. The longest of these breaks in the plain is caused by the Mendips (see Plate XXXVIIIB), whose narrow limestone plateau rises to a height of 1068 feet. It is 24 miles long and five miles broad. Its bare, dry surface is covered with short grass and affords good pasture for numerous sheep.

Farther west this flat country disappears in Devon and Cornwall and is replaced by innumerable humps, high ridges, winding valleys, and expanses of woodland. The irregularity of the relief exists in detail only, for the district forms but a single plateau averaging some 550 or 650 feet in height in the north and some 400 or 500 feet in the south. It tilts gently down towards the English Channel and is characterised by a vast number of minor topographical details. The scenery becomes picturesque on the coast, where the valleys become narrower and more steep-sided. These gashes cut in the plateau-edge by the swift, clear streams are marked by incised meanders, rocky sides, and closely set leafy woods. In the drier

PLATE XXXVII



[Photo Preston, Penzance.

A. THE SCILLY ISLES

A view of Tresco showing Dolphin Town in the foreground, with a number of rocky headlands and islets beyond.



[Photo: Preston, Penzance.

B. THE HORSE, KYNANCE COVE

This frowning strip of coast occurs near the Lizard in Cornwall. Note the little rocky inlets, the sheer cliffs, and the flatness of the plateau above.

[To face page 246.

PLATE XXXVIII



[Photo: Lupton, Bradford.

A. THE CLIFTON GORGE

This has been cut by the Bristol Avon. The view is taken looking downstream from the suspension bridge at Bristol.



[Crown Copyright.

B. THE CHEDDAR GORGE

Of unknown origin, the gorge runs through the limestone of the Mendip Hills



[Photo Preston, Penzance.

C. A TIN MINE AT BOTALLACK, CORNWALL.

seasons the rivers are modest streams ; the discharge of the Exe, for instance, being no more than 10·5 cubic yards of water per second above Exeter ; but they become wild torrents when the water from the impermeable plateau rushes into them. The Exe has been known to rise more than 6 feet in twenty-four hours at Exbridge.

The dissected plateau is overlooked at a distance by massive heights whose summits are flat and smooth and which form isolated peaty moorland. One of these upland areas, Exmoor, falls away to the Bristol Channel in wild cliffs. Dartmoor, the most remarkable of them all, has an area of 386 square miles. From its granite heights a number of streams, including the Okement, Taw, Teign, Dart, Avon, Meavy, and Tavy, flow down in all directions on to the lower wooded plateau. At times curious topographical forms strike the attention amid the monotonous peat moors. These are the 'tors,' or great piles of granite blocks resembling huge courses of masonry. Other granite bosses outcrop along the peninsula right to its end, forming bare humps whose surfaces are sometimes broken by a confusion of boulders and at other times lie half-buried beneath a thick layer of sand. Such is the origin of Bodmin Moor, which rises to a height of 1375 feet, the Hensbarrow Downs, which culminate at 1026 feet, the Redruth heights, and the Land's End peninsula. The last trace of this string of granite bosses which runs for 100 miles from Dartmoor to Land's End is found in the Scilly Isles, which are situated 28 miles from the coast.

THE COAST. The general outline of the coast reflects the distribution of the relief of the land. Wide bays, like Lyme and Bridgewater Bays, correspond to low ground ; the Exmoor *massif* is continued out to sea in Lundy ; whilst prominent headlands denote the presence of hard rocks, like the granite of Land's End (see Plate XIIB), the serpentine of the Lizard (see Plate XXXVIIIB), and the mica-schists of Start Point. But all the bold, well-marked, scarped features which occur along the coast of Devon and Cornwall are due to the last great positive movement which caused the lower portions of the land to be drowned by the sea. To this final movement was due the isolation of the Scilly Isles, which are separated from Land's End by 28 miles of sea. The Admiralty chart shows that they rest on a submarine platform 40 fathoms below the surface of the sea, and this platform seems to be a continuation of the peninsula of Cornwall. A further continuation appears in the undersea plateau of the Seven Stones, or 'the City,' as English fishermen call it, in allusion to the capital of the fabled land of Lyonesse. Still farther southwest a solitary islet bears the Bishop Lighthouse, the first gleam of light to be seen by passengers from

America when they enter the Channel. The Scilly Isles comprise forty-eight islands and a thousand or more reefs. The biggest are St. Mary's, about two and a half square miles in extent ; Tresco, less than a square mile (see Plate XXXVIIA) ; St. Martin's ; and St. Agnes. These are all in the northwest of the group. Southwestwards, that is, in the direction in which the peninsula tapers, the islands become smaller and smaller.

In spite of the frequency of storms and of the violence of the waves, the resistant rocks of this coast have not yielded to the sea. Almost throughout its length the land keeps its youthful forms which have resulted from drowning. These include the long, winding, branched estuaries which occur at Falmouth, Fowey, Plymouth, and Dartmouth ; the many rocky headlands enclosing little semi-circular bays, within which lie small inner basins, or coves, whose shores have been carved into an infinite number of creeks, bluffs, and points ; and the magnificent line of cliffs whose appearance varies with the kind of rock which confronts the waves. In eastern Devon the cliffs are red, being made of Permian marls and sandstones, and their crumbling faces are notched with ravines. At Land's End the granite cliffs are full of cracks and break up into reefs and stacks. At Clovelly and Lynton the cliffs are so wild that the little streams leap headlong over them to fall on to the beach below (see Plate XXXIXA).

In contrast with these youthful forms are the gentler features which occur where the plains reach the sea. Headlands are rare on the shores of the Channel between the mouth of the Exe and Portland Bill. The estuaries are silted up and blocked by sandspits. Chesil Bank is a smooth spit of pebbles running along the seaward side of a row of lagoons. Huge landslips occur to the east of Seaton (see Plate XLA), where masses of sand and chalk slip down to the sea whenever the underlying beds of soft Liassic clays become saturated by rain. In 1839 a considerable area of land, comprising a wheatfield, a cottage, and a well, slipped to destruction on the beach below. Such occurrences happen time and time again, and cracks in the ground indicate that other slides will take place in the future.

Forms which mark an advanced stage in the smoothing process are found mainly along the low portions of the Somerset coast. Except for the projections of ancient rocks which stand out in rocky promontories at Middle Hope, Worle, and Brean Down, deposition prevails everywhere, and the coastline presents the appearance of a typical low, flat region. Shallow water infested with sandbanks, like the English Grounds, Gore Sand, Graham Bank, Culver Sand, and the Berrow Flats, force vessels to hug the Welsh coast. Quantities of mud are deposited in the estuaries of the Parrett and other

streams nearby. Vast expanses of sand and mud are laid bare at low water, the tides attaining a range of 44 feet at the equinoxes. Dunes are built along the shore with material swept by the wind from the beaches and sandbanks. In short, despite local advances of the sea, the bays are slowly being filled in and the estuaries silted up.

RURAL LIFE. The West Country contains little industrial life, its scenery is mainly rural, and its people earn their living chiefly from the soil. The agricultural character of the region is reflected in its wooded appearance and the lines of trees and hedges which enclose the fields. Between the gnarled roots of oak, ash, and beech the hedges are closely planted with holly bushes, hazel-nut trees, bracken, and festoons of ivy and clematis. When the winds from the sea are too strong for trees to grow, walls made of granite blocks replace the hedges. Sunken roads and country lanes pass between the sheltering hedgerows, whose banks bloom with wild flowers in spring. The villages and farms are ringed about with apple trees, for this is the land of cider, the familiar drink of the countryfolk of Somerset and Devon (see Plate XLB).

The fields contain grass more often than cereals—seven times more in Somerset and four times more in Devon and Cornwall. Large areas formerly under oats, and, more especially, wheat and barley, are now used for grass as well as fodder crops, potatoes, mangold wurzels, cabbages, and turnips. The maritime climate favours the growth of vegetation and enables stock to remain in the open day and night. Stock-farming has developed more in Somerset than in any other part of Britain. Four-fifths of the cultivated soil is under grass, and there is no hay equal to that derived from the fields near Taunton or the famous Pawlett Hams on the banks of the Parrett. In Devon the water of the streams which flow from the granite moors is used for scientific irrigation. Throughout the region the number of livestock reaches astonishing proportions. In Cornwall there are 270 head of cattle to every 1000 acres, in Devon 195, in Somerset 250, whilst the average for the whole of England is 173. Devon is the home of a breed of cattle with long, straight horns and a red coat. Though fattening for the slaughter-house is not neglected, the production of milk and butter constitutes the main object. The produce is sold in the towns, chiefly in Bristol, Plymouth, and London. The famous Cheddar cheese is made in a little district in Somerset between the Mendips, Yeovil, and Frome. But all the other forms of pastoral production find a place in these green countrysides, including the raising of mutton sheep and pigs and poultry farming. Children are often met with on the Cornish roads driving flocks of geese out to pasture.

The upland wastes of Exmoor and Dartmoor, which are exposed to the wind and saturated by damp mists, are treeless, uncultivated, and given up to heather, broom, gorse, bracken, and bilberry bushes. But the lower portions of Exmoor, up to the 1200-foot contour, are used as sheep pastures, the fields being enclosed by stone walls and banks of earth strengthened with beech shrubs and heather. Higher up on the broad upland moors, however, solitude reigns. One can walk for hours through the Dunkery district without hearing a sound other than the song of a bird, and without meeting a living creature except a deer or one of the half-wild ponies which are turned out by their owners to graze on the moors (see Plate XLc). In spite of its low elevation of just over 2000 feet, Dartmoor has the character of true mountain country. It is subject to strong winds that kill the trees and to occasional falls of snow as late as April; a damp air lies on its peaty soil; and unbroken moorland reaches to the horizon. Cultivation and human settlement are never found above the 1200-foot contour, but tend to take refuge in the sheltered valleys. There they nestle amidst fields of oats and hay under shelter of hedges of hawthorn, holly, and laurel. Every parish in Dartmoor enjoys the use of a piece of the moor, from which the farmer can take stone, peat, and stubble. He may burn and grub up turf in autumn, and pasture on it his cows, sheep, and ponies.

Very different from the cold upland moors is the Channel coast, which is indeed a 'riviera' where frosts seldom occur in winter and where the summers are almost brilliant. Sub-tropical plants flourish, and near Penzance myrtles, fuchsias, rhododendrons, and laurels grow in the open. The fronts of the houses are adorned with red geraniums, and palms and cacti are by no means rare (see Plate XIVB). In the Scilly Isles rose-bushes and fuchsias flower in winter, and the garden of Tresco Abbey contains a wonderful collection of exotic plants. The favourable climate is naturally taken advantage of by cultivators. On the Cornish coast they concentrate on potatoes, which compete in the London market with those of Jersey, and nearly every farm produces cauliflowers, strawberries, and garden flowers. Right out in the ocean, the inhabitants of the Scilly Isles earn their living almost wholly by growing flowers for the London market. Formerly they began by supplying early vegetables, but after 1870 and up to the outbreak of war in 1939 their attention was concentrated on flowers—narcissi, daffodils, lilies, carnations, irises, violets, anemones, and marguerites. For six months in the year the whole population devoted its time to growing flowers. Seeds were sown or slips planted in October; narcissi bloomed in January; and from December to June flowers were picked, packed, and despatched. The old occupa-

tions of fishing and the production of soda from seaweed were forgotten, and all work was confined to the little flower gardens from which, thanks to the mild climate, a living can be made. But during 1939–45 difficulties of communication largely checked this occupation, which after three years of peace is only now returning to normal.

2. THE TOWNS

The West Country contains a large rural population. Apart from the towns, Cornwall has a density of population of 238 persons to the square mile, Devon one of 168 persons, and Somerset one of 246 persons. These are high figures for country districts, but they are decreasing owing to emigration and the increase in land under grass. There are few towns, except along the coast ; and those that exist are nearly all market-towns representing agricultural interests. At the foot of the limestone wolds and downs on the eastern border of the peninsula lie a series of little towns, viz. Trowbridge, the headquarters of Wilts United Dairies, Ltd., a firm which supplies much of London with milk ; Frome, which is mainly engaged in printing and brewing ; and Yeovil (pop. 19,000), which is now an industrial town and manufactures oil engines, etc. Taunton (pop. 25,000), which is the county town of Somerset, though it is on the borders of Devon, is the focus of trade in the fertile plain nearby. Wells (pop. 4,800), which lies at the foot of the Mendips, has been the see of a bishop since the 10th century and sleeps under the shadow of its cathedral. Bath (pop. 69,000) owes its prosperity to its thermal springs. The Romans, who named it *Aquæ Sulis*, built a fine town on the site, and in the Middle Ages it engaged, as did its neighbours, in cloth manufacture ; but it resumed its function as a health resort in the 17th century, when it became a fashionable watering-place for the quality. To-day it is a prosperous residential town for the well-to-do, attracting people of independent means as well as affording a quiet resort much sought after by invalids. It also manufactures boots and shoes.

The peninsula tapers towards the west and contains but few inland towns in this part. Those worth mentioning are Tiverton (pop. 9,600), whose machine-made lace industry is a survival of the old textile manufactures ; Totnes (pop. 4,500), which stands at the lowest bridge across the Dart ; Tavistock (pop. 4,550), which grew up round a 10th-century abbey and is a tin-mining centre ; Bodmin (pop. 5,500), the little county town of Cornwall. The only really organised town is Exeter (pop. 66,000), whose functions go far back into the past. It stands on a slope on the left bank of the Exe on the bridge farthest downstream. On this natural site existed successively a British settlement, a Roman route-stage, a Saxon

capital, an Anglo-Norman fortress with the castle of Rougemont, a populous medieval city with a 12th-century cathedral and a town hall dating from the 15th century, and a centre of cloth-weaving which in the 16th century exported its wares as far as the Levant. Shipping has now deserted it, since its estuary is too shallow. It pursues a quiet unruffled life. In addition to its old artistic industries which are still carried on near the cathedral, it now contains in the suburbs flour-mills and factories for making paper, soap, and farm machinery.

These country districts and their quiet little towns would always have lived in obscurity had not their mines called attention to them. In ancient times the region was known as the Cassiterides, owing to its rich beds of tin ore. Near the granite bosses, and particularly near Camborne and Redruth in Cornwall, a number of veins of copper and tin run through the Devonian schists which are termed 'killas' by the miners. In the Middle Ages the mines were worked from the 12th century onwards. The miners were organised in the 13th century into two corporate bodies known as the Stanneries, one for Cornwall and the other for Devon. A meeting of the Devonshire body is still held annually on Crockern Tor overlooking Two Bridges. From the 18th century onwards the mining, which till then had been carried on mainly in Devon, moved westwards, and at the beginning of the 19th century it was in full swing near Redruth, Camborne, St. Ives, St. Just, and Penzance. The whole mining district seemed to be ploughed up and gutted, and tall white factory chimneys rose above the pitheads and slag-heaps. In ancient times and during the Middle Ages open quarries supplied stream-tin, but when these sources were exhausted the ore had to be extracted from the rocks by sinking deep shafts and pumping out the underground water. In 1705, Newcomen invented his steam pump to raise the water. At the present day the Dolcoath mine goes down to 2100 feet. Several of the galleries run out under the sea and are so near the sea-bottom that the sound of rolling pebbles can be heard and precautions have to be taken against the penetration of the mines by sea-water. The working of tin here certainly goes back to the Bronze Age, and in ancient times Cornwall supplied the Mediterranean lands with this valuable ore. In the Middle Ages the whole of Europe depended on England for its tin; but after the discovery of beds of the metal, first in Germany in the 16th century, then in Malaya in the 18th century, England lost its position as the only tin-producing country. The price fell, and production began to decline in the West Country. Between 1873 and 1892 the quantity of ore extracted amounted to 14,270 tons, but this decreased to 4,858 tons in 1920, to 1078 tons in 1921, and 2000 tons in 1935.

PLATE XXXIX



[Photo: Aerofilms.]

A. LYNTON, NORTH DEVON

The town lies at the bottom of a deep-cut valley typical of the coast of North Devon



[Photo: Harvey Barton, Bristol.]

B. DARTMOUTH

The town is built on the banks of the estuary of the Dart. The inlet is a typical ria.

[To face page 252.]

PLATE XL



[Photo. A. Demangeon.

A. A LANDSLIP AT SEATON, DEVONSHIRE
A large portion of the chalk cliff has fallen away.



[Photo: Briquet, Strasbourg.

B. ENCLOSED FIELDS USED AS PASTURE AT OKEHAMPTON, DEVONSHIRE



[Photo: A. Demangeon.

C. VIEW OVER EXMOOR

For the same reason the amount of copper extracted fell from 13,000 tons in 1851 to 160 tons in 1919. To-day the output is almost nil, many of the mines have closed down, and the miners have emigrated to America and Australia. As a result, the population of Cornwall fell from 369,390 in 1861 to 317,951 in 1931. In spite of the decay of mining, Redruth (pop. 10,000), and Camborne (14,000) are still dependent on it (Plate XXXVIIIc); but Truro (pop. 11,000) is now a life-centre for central and west Cornwall.

Though tin mining is dying out, that of kaolin is holding its own. This mineral is much sought after for making fine porcelain and is used in the production of paper and in cotton spinning. It is a pure white clay resulting from the decomposition of granite and was discovered in 1748. It abounds in certain parts of Dartmoor and near St. Austell in Cornwall, and it is shipped at Teignmouth, Par, and Fowey to the Mersey district and the Potteries as well as to the United States of America. In 1914 the quantity mined was 800,000 tons, but since that date it has greatly diminished. Near Falmouth there are granite quarries which yield fine building stone, but they have suffered from Norwegian competition, and many of the quarrymen have emigrated to America.

3. MARITIME OCCUPATIONS

The inlets and bays which penetrate the peninsula cause the sea to influence the life of the people to some extent throughout the region. A cluster of little seaports hum with activity on the coasts and at the heads of the estuaries. Some of them are little trading centres which grew up near the lowest bridge across their streams to serve as outlets for their immediate backlands. Such are Bridgwater (pop. 17,000) on the Parrett, Barnstaple (pop. 14,700) on the Taw, and Bideford (pop. 8,800) on the Torridge. A vast number of others have developed as seaside resorts on the picturesque coast, either on the limestone headlands in the Severn estuary, as in the case of Clevedon and Weston-super-Mare; or at the mouths of the wild Exmoor ravines, as in the case of Minehead, Lynton, Lynmouth, and Ilfracombe; or on rocky bays whose little beaches face the Atlantic, as in Clovelly, Tintagel, Newquay, and St. Ives; or, finally, on the bright, sunny shores of the English Channel, as in Dawlish, Paignton, Teignmouth, and Torquay.

One stretch of this remarkable coast noticeably surpasses the rest in its amount of traffic and the busy character of its maritime life. It extends from Tor Bay to Land's End, that is, just where the coastal forms are most youthful and irregular, where the sea penetrates inland through many branching rias. It fringes the

western entrance into the British Seas and is the first land seen by sailors coming across the Ocean. Southern fish, like the mackerel and pilchard, frequent its waters, and its maritime outlook urges men to seafaring occupations.

The fishing banks here cannot compare with those of the North Sea, nor is there any port to match Grimsby or Yarmouth. But the region is unrivalled in the variety of its catch. For centuries shoals of pilchards have been appearing in August and September off the northern and southern coasts of Cornwall. Fishing fleets put out every day from Padstow, St. Ives, Falmouth, Newlyn, Penzance, Brixham, and all the other little ports along the coast, returning home in the evening. In the 17th century the pilchards were smoked for export to France, Spain, and Italy; but today the fish are preserved in oil. Other types of fishing take the boats further out to sea, and these ventures in former days formed the school in which were trained the bold sailors of Devon, the sea-dogs of Elizabethan times. In May and June mackerel are caught round the Scillies and off the south coast of Ireland; in August and September the boats fish for herring off the Cornish coast; finally, trawlers from Brixham and Plymouth, some of which remain the whole year round on the banks between Portland Bill and the Lizard, bring into Brixham fresh fish, including the soles for which the port is famous. The larger boats spend the period from January to August fishing in the Irish Sea and Bristol Channel, landing their catch at Milford Haven, whence express trains hurry it off to the great towns.

Except for some local coastwise trade, commerce holds little place in the life of the ports on this coast, for there is only a limited backland. In the 17th century Falmouth was used as a terminus for mailboats from the West Indies, Portugal, and New York, couriers from London reaching Falmouth by way of Exeter and Truro; but, though this function still persists, the port is overshadowed by Plymouth and Southampton. Today the ports content themselves with the modest trade of their immediate neighbourhood. They all import Welsh coal; Fowey exports kaolin, and Penzance flowers, vegetables, and fish. None of the towns mentioned is of any considerable size, Penzance having a population of but 11,300, Falmouth one of 13,500, and Dartmouth one of 6,700 (see Plate XXXIXB).

There is, however, one large urban centre of 208,000 inhabitants. This is Plymouth, which with its annexes of Stonehouse and Devonport (see Fig. 62) extends along the shore of Plymouth Sound. This magnificent estuary is accessible to the largest ships and is divided into several arms and bays, viz. the Cattewater, or mouth

of the Plym, Sutton Pool, Mill Bay, Stonehouse Pool, and the Hamoaze, or mouth of the Tamar. Of the four peninsulas which separate the branches, three are occupied by one of the divisions of the great town. Sewards the inland waters open out into a large roadstead known as the Sound, in the middle of which rises the little island of St. Nicholas. The southern entrance of the harbour

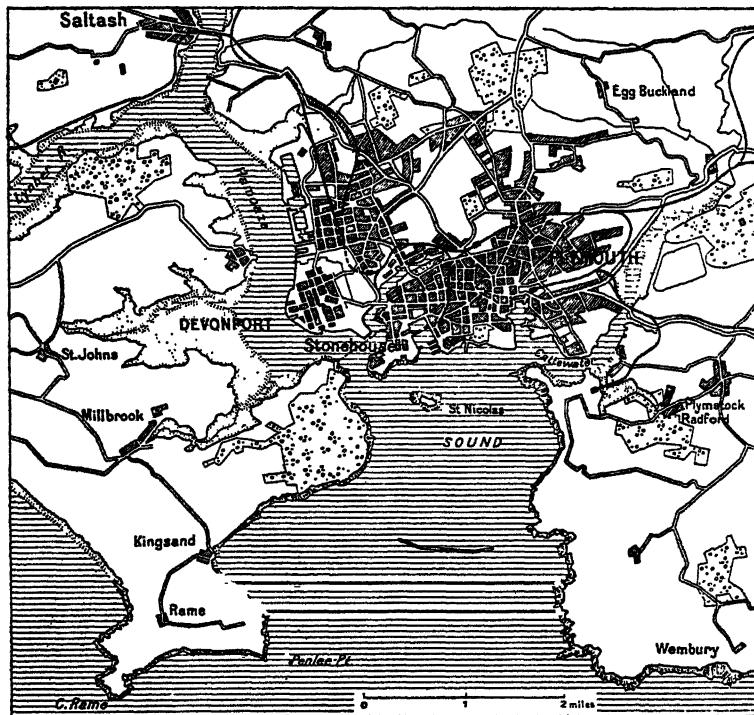


FIG. 62. Plymouth, showing the Estuary and the Town.

is sheltered by a huge breakwater 1700 yards long, which was built between 1812 and 1840. Right out to sea, on an isolated rock 13 miles from the coast, stands the Eddystone Lighthouse. The wonderful harbour formed by the estuary has become a powerful naval base. The original nucleus of the present town was Plymouth itself, which grew up around a 13th-century priory. At the end of the 14th century it already had a population of 4,850. Its ship-owners and sailors took part in all the great ventures of the past, and it was from this port that Drake sailed on his expeditions in

1572 and 1587, and from which he and Hawkins set sail for the West Indies in 1595. At the end of the 16th century and the beginning of the 17th several companies formed for the colonisation of New England had their headquarters at Plymouth. At the end of the 17th century the town became a naval port, and from that time this function has dominated all others. The naval dockyards, which were begun in 1690, were constructed to the west of Plymouth on the banks of the Hamoaze and bore the name of Plymouth Dock. In 1824 the area was renamed Devonport. Today it contains an arsenal and a repairing yard for warships, and it is the headquarters of the general staff of the British Navy. Stonehouse, on the neighbouring peninsula, contains the other branches of the naval base, viz. storehouses, provision factories, barracks, and the naval hospital.

The development of the naval base into a large town with an up-to-date harbour attracted other forms of maritime activity. In its character of a commercial port it exports ore and local building stone, and it imports the foodstuffs required by its population and the raw material needed by the arsenal. As a fishing port it not only has its own trawlers, but is also used by boats from Grimsby and Hull, which put in to express to London the fish caught in the Channel and the Bay of Biscay. It is also a port of call visited by British passenger steamers bound for Australia, India, New Zealand, and South Africa. Many transatlantic passengers who are pressed for time and wish to do part of their journey by train embark or land here. In this outport function Plymouth rivals Southampton.

Bristol, the largest port in the southwest of England, is actually not on the peninsula, but is situated at a point where the sea penetrates deeply into the mainland. Built at the lowest spot at which the Avon estuary is bridged, it stands at the upper end of the Clifton gorge well above the coastal marshes, eight miles from the sea. The flood tide brings the level of the water 25 feet above the hydrographic zero and at especially high tides more than 39 feet above it. Easy routes from the Thames basin and London pass through wide gaps in the downs and wolds, and thus Bristol occupies the natural terminus of the route across the country leading from London to the Atlantic. Its first trade was with Ireland, then through Ireland with Scandinavia. In the reign of Henry II it traded in French wines. Its shipowners eagerly joined in the exploitation of the New World at the end of the 15th century, and it was from this port that Cabot set sail in 1496 and again in 1498. At the end of the 17th century the merchants of Bristol had a virtual monopoly of the West Indian sugar trade. Their ships, laden with English goods, sailed for West Africa, where the merchandise was exchanged for slaves. When the

negroes reached the West Indies they were sold to the planters, and the ships returned to Europe with cargoes of sugar, rum, tobacco, and rice. Thus were created the vast fortunes of the Bristol sugar refiners, the 'West Indiamen,' whose sumptuous hospitality became proverbial. At the beginning of the 18th century Bristol ranked second to London, and above Liverpool, among English ports. But at the end of the same century decline set in and Liverpool forged ahead. Bristol lost heavily through the recognition of the independence of the United States and by the suppression of the slave trade. Furthermore, unlike Liverpool, it had no industrial district to serve. The little coalfield which is situated near it to the north of the Mendips is rather difficult to work and produces barely 130,000 tons of coal a year. For a long time Welsh coal could be imported only over difficult routes, and it was not until 1887 that a five-mile tunnel was driven under the Severn estuary. Finally, the increase in the tonnage of ships increased the obstacles to navigation in the little estuary of the Avon. From 1803 onwards great engineering works were necessary to improve the port. The New Cut was constructed to straighten the river, the old docks were freed from obstructions and deepened, and the present long, narrow Floating Harbour was made, giving a depth of 36 feet at high tide right in the middle of the town. But soon the Avon became inadequate, and it was necessary to move down to the sea and provide the town with docks on the coast. Accordingly, docks accessible to large cargo boats were constructed at Portishead and Avonmouth in 1877, 1880, and 1908. The port of Bristol has thus been divided into two parts, one of which remains in the town itself, whilst the other has moved to the sea coast. On the figures for its overseas trade alone Bristol now takes eleventh or twelfth place among British ports. But there is a great discrepancy between its imports and exports, for the absence of an industrial backland creates a shortage of exports. In the town itself there are many industries which receive raw material from abroad, but send relatively little overseas. There are sugar refineries, cocoa and tobacco factories—all of which are survivals of the old trade with the colonies ; then there are sawmills, soap works, boot and shoe factories, copper works, aircraft factories, and railway workshops. On the other hand, Bristol's market extends into the Midlands and includes London, and for this area and its own population it imports cereals, meat, petrol, West Indian fruit (bananas, pineapples, and oranges), sugar, tobacco, timber, and Irish dairy produce. Its commercial and industrial activity supports a population of 397,000, a figure which has been steadily growing since the middle of the 19th century. The town has spread out westwards, especially on

the high limestone plateau of Clifton Down which shuts in the town in that direction. Here a suspension bridge, which was built in 1864 and stands 250 feet above the river, crosses the gorge. Clifton is the residential quarter and has many parks and gardens. It is in great contrast with the old town whose business houses are crowded round the docks. Bristol has not grown up in a disorderly manner at a whirlwind pace like the new towns in Wales and Lancashire, and it proudly maintains the splendid relics of its glorious days, including a Templar church, its parish church of St. Mary's Redcliffe, its cathedral, and the offices of the old colonial shipping companies.

4. THE CHANNEL ISLES

The Channel Isles consist of the large islands of Jersey, Guernsey, and Alderney, together with a great number of smaller ones. They are politically connected with Great Britain and are a remnant of the English possessions in Normandy which were lost in 1204. Geographically they are a fragment of Normandy. Alderney, which is the nearest of the islands to England, is 64 miles from Weymouth as the crow flies, but only 25 from Cherbourg. St. Helier in Jersey is six hours' journey by sea from Weymouth, but only one hour or an hour and a half from Carteret in Normandy.

The islands are composed of the same granites and crystalline rocks as the Cotentin peninsula, to which they were joined in a recent geological epoch. As in the case of the Scilly Isles, the separation dates from the positive movement which formed the Straits of Dover and the rias of the coasts of Devon and Cornwall. It seems certain that prehistoric man reached the islands by walking over dry land. The group contains four sub-groups : Alderney, Brechou, and the Casquets, in all some 1962 acres ; Guernsey with Sark and Herm, in all 15,680 acres ; and Jersey together with the shoals which contain the clusters of the Minquiers and the Chauseys, in all 28,726 acres. At low tide the shelf on which the islands stand is partially uncovered and thus doubles their area. An uplift of 180 feet would join the shelf to the Cotentin peninsula. A lesser uplift of 120 feet would make Alderney, Brechou, and the Casquets into a single island 12 miles long and would thus erect a gigantic breakwater which would close the northern end of the sea between the Channel Isles and the Cotentin peninsula.

The outline of the coasts and the nature of the climate show that the islands are greatly influenced by the sea. The tides have a range of between 40 and 50 feet and cause swirling, complex tidal streams which at the equinoxes flow between Cape la Hague and Alderney at a speed of eight miles an hour. Between Guernsey and

the Casquets tidal streams come from all points of the compass during the ebb and flow and carry ships long distances out of their courses. Rough waves beat violently on the shores. The island of Sark, which rises nearly 400 feet above the sea, ends all round in cliffs so steep that there is no natural way up them. To reach the plateau from the little bay of Creux one must pass through a tunnel, whilst at other points the paths from the seashore to the heights above climb through cuttings and chimneys hewn out of the rock. On all sides the cliffs are eroded into stacks, rocky projections, reefs, and submerged rocks. The coastal scenery in the north of Jersey contains wonderful effects of relief and colour, with their cliffs clad in green even in winter, their rocky creeks decked out with brown vegetation, their ragged rocks, their peninsulas, caves, stacks, and natural arches.

The waters are so dangerous as to make seafaring unpleasant, and it is gradually being given up. Sailors from Jersey no longer voyage to Iceland and Newfoundland, as they once did ; and few men still fish for lobsters and mackerel off the shores of the islands. The inhabitants are turning to agriculture and earn their living from their plots of land. This tendency towards agriculture is favoured by the maritime climate, whose winters are mild and long and whose daily range of temperature is extraordinarily low. There are no night frosts ; the rainfall is distributed over a large number of rainy days, *e.g.*, Guernsey has a rainfall of 34 inches and 104 days of rain, and there is a delightful Indian summer which lasts till November. Many sub-tropical plants grow in the open, including the arbutus, magnolia, myrtle, rhododendron, camellia, and yucca. Since there is no fear of frost, and as the growing period is long, the farmer may hasten or delay his time of sowing and produce delicate plants fifteen days ahead of the mildest parts of England. The only touch of severity about the climate comes from the wind. Neither trees nor cultivated plants can exist without shelter. Hence whilst the wind-stricken plateau ridges are bare, the little valleys are, as it were, oases which afford shelter for magnificent vegetation.

The soil, which is naturally infertile, has been enriched by cultivation. For centuries past manure derived from the sea has been applied. The land never lies fallow, never rests ; but it yields astonishingly fine crops. A good field in Jersey will give 5 tons of hay at a single crop. Even as far back as the reign of Edward VI the tithes of the produce of Jersey were regarded as solid revenues. The land is so fruitful and valuable that it is parcelled out into little estates and small holdings. In Jersey the average farm barely exceeds 10 or 12 acres. From the minute subdivision of the land originate the walls and hedges which cut up the cultivated land into

regularly shaped patches and thus give the landscape its most characteristic feature. In Guernsey dry walls are used ; in Jersey hedges or earthern mounds with trees growing on them are preferred. There are no villages or rural centres, for the farms are scattered among these little properties.

Up to the middle of the 19th century the people lived by the traditional occupations of cereal and apple cultivation, and woollen garments were knitted by the women of the family. But the development of rapid transport and the expansion of the markets has wrought a complete change. The countryfolk now bestow all their attention on their livestock, and cereal cultivation has been replaced by that of fodder crops, irrigated hayfields, clover, turnips, parsnips, beet, and tree cabbages. Jersey cows, which are small, but have delicately formed, graceful bodies, are excellent milkers. There are 7000 on the island and 6000 in Guernsey. One farm of 37 acres has eighty head of cattle. From the milk, which is very rich in cream, butter of excellent quality is made for export. Specialisation in the production of butter is carried to such lengths that butcher's meat has to be imported from France and England.

The prosperity of the Channel Islanders, however, depends today on kitchen gardening. One-fourth of Jersey is devoted to potato crops. Planting is done in February, and at the end of April or the beginning of May the tubers are dug up and despatched to the London market. Gangs of Bretons are imported to help with the harvesting. As soon as the potatoes are harvested, turnips are sown in their place, and this crop is reaped in October. The soil thus yields two crops a year. To new potatoes the mildness of the climate makes it possible to add every kind of delicate vegetable product which might be suggested by the business mind. In Guernsey grapes, tomatoes, figs, melons, and peaches are grown in glasshouses, as are also hot-house potatoes which are sold at the end of March, and bulbs which are shipped to Haarlem in the Netherlands. Similar crops are grown in Jersey, but, owing to the less misty and more southern climate, more of the vegetables are cultivated in the open.

The density of population in the islands is extraordinarily high. There are 985 persons to the square mile, the total population being 93,000, of which 50,400 live in Jersey and 42,600 in Guernsey. Every inch of soil is bitterly contested, and there would be no room for newcomers. Many of the sons of the smallholders have emigrated to Canada, the United States, or England. Whilst the countryside has been depopulated in this way, the towns have been growing almost inordinately. The 18,000 inhabitants of St. Peter Port form 43 per cent. of the population of Guernsey, and the 27,900

residents of St. Helier constitute 54 per cent. of the population of Jersey.

The Channel Isles have been connected with England for more than seven centuries. Apart from two or three raids, France has never made serious efforts to retake them. They formerly lay within the diocese of Coutances, but in 1568 they were transferred to that of Winchester. In spite of their connexion with England, their insular position has always maintained the local peculiarities of the little group. Jersey and Guernsey are still independent of the British Parliament, and are each governed by their traditional local legislatures, or 'States.' The King of England is represented in his capacity of Duke of Normandy by lieutenant-governors. In Guernsey the 'States' have the right to issue bronze coins bearing their arms. There are no customs duties on English goods. Their language is derived from Norman-French and is still the official medium of the law courts and States; and young men go to Rennes or Caen to study law. The old Norman-French dialect is disappearing before the spread of English in the south of Jersey and the east of Guernsey, but its drawling intonation is still heard in the north of Jersey and the west of Guernsey. English influence is successfully overcoming the surviving traces of French culture. It acts on men's minds through the Protestant religion and through material interests arising from economic connexions. The produce, consisting of early vegetables, flowers, butter, and livestock, is shipped to Southampton and Weymouth. Every year English trippers swarm over the islands, and people with independent incomes and retired officers are constantly settling there. The spread of English influence throughout the group is seen in the changes in dress, cookery, and type of dwelling. The long rows of private houses and cottages strung out along the roads and the clean, regular, plain style of the villas give St. Helier the appearance of a typical English town.

CHAPTER X

THE ENGLISH PLAIN

INCLUDING THE MIDLANDS, THE FENS, EAST ANGLIA, AND THE THAMES BASIN

ALONG the eastern flank of the Welsh mountains and to the south of the Pennines a wide plain similar in appearance and formation to those which occur on the other side of the North Sea and English Channel in Belgium and France extends from the North Downs to the Humber. It forms the western margin of the sediments of the Germanic Basin. This English Plain is the fellow of the Belgian Plain and the Paris Basin. Here the ancient rocks are buried deeply under surface layers of less resistant Secondary and Tertiary rocks. The relief is less pronounced, and the land slopes down to the sea by almost inappreciable gradients. The more mature topography results in less abrupt slopes and wider valleys than are found in the more ancient uplands, in expanses of alluvial-filled hollows, in an abundance of surface deposits, and in a more regular coastal outline. Between the Thames and the Humber the elevation of the land exceeds 300 feet at very few points.

The wild scenery of the moors, the sombre colours of the ancient rocks, and the stern aspect of the mountainous districts appear only in a subdued form in outliers of the old upland blocks like the Wrekin, Charnwood Forest, or the heights which contain the Midland coalfields. Except in these relatively small areas the basement rocks of the Primary are buried under thick beds of more recent sediments. Borings have proved the continuity of the ancient structure beneath the surface. Near Dover, for instance, a continuation of the Bristol coalfields has been discovered at a depth of 1,300 feet, beneath the Tertiary and Secondary beds. But at the surface there is no sign of the dislocations which have fractured the basin into a number of horsts and rifts.

The quiet relief of the English Plain is due to the almost horizontal arrangement of the strata and to a thick mantle of boulder clay which often masks the various outcrops. Ice has not only worn away the roughnesses of the surface, but has also filled in the unevennesses with deposits of clay and sand. In the counties of Stafford, Leicester, Warwick, Northampton, Buckingham,

Bedford, Hertford, Norfolk, Suffolk, and Essex boulder clay covers nearly the whole surface and is particularly widespread in the broad depressions and flat expanses. It reaches as far south as the Thames and as far west as the outskirts of Gloucester, covering the surface, levelling off the features, and giving the country a uniform

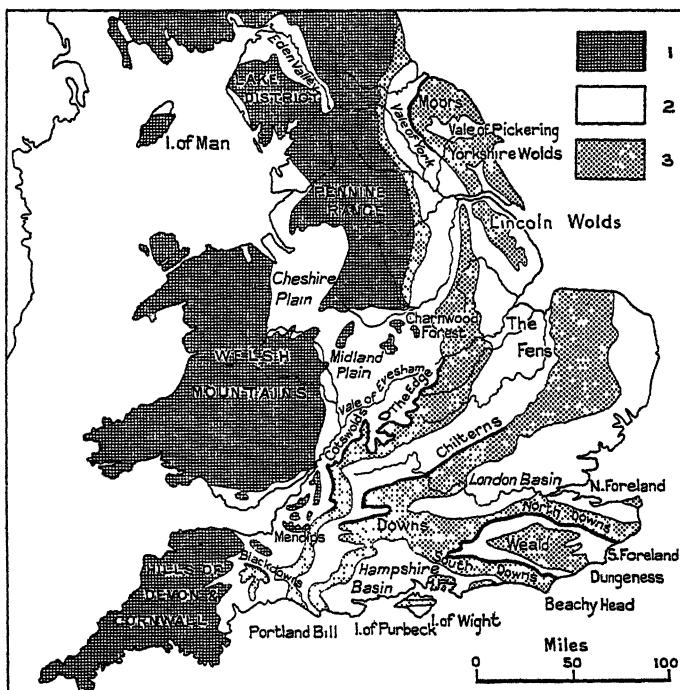


FIG. 63. Structural Belts of the English Plain.

1. Ancient rocks.
2. Belts of soft rocks forming depressions in the Plain.
3. Belts of hard rocks forming escarpments.

appearance. Under it the variety of the structural rocks is concealed. Hence the English Plain is strikingly poorer than the Paris Basin in local peculiarities. Whilst a journey from Paris to the Central Highlands of France displays to the traveller a series of little districts each with its own special scenery and methods of land utilisation, it is difficult to imagine a journey which is duller and less varied in its scenery than that from London across the English Plain to the borders of Scotland or Wales.

1. RELIEF AND SCENERY OF THE ENGLISH PLAIN

The essential feature of the English Plain, like that of the Paris Basin, consists of a series of Secondary and Tertiary beds which dip gently towards the east and southeast. The older beds disappear under more recent strata, giving rise to a series of belts running northeast-southwest. Each of these belts has a different effect on the relief, according as it consists of hard or soft rocks. Two of them stand up in lines of hills of Jurassic limestone and chalk respectively, whilst the other three form long depressions which follow the outcrops of marl and clay of the Trias and Lias, the clay and sand of the Jurassic and Cretaceous, and the sands and clays of the Tertiary (see Fig. 63).

Between the foot of the outer slopes of the ancient uplands and the first range of hills in the Plain, the marls, clays, and shales of the Trias and Lias form a widespread belt. The red colour of the Triassic marls so affects the ploughed fields, building material, valley slopes, and, in fact, the whole landscape that the district is popularly known as the 'red plain.' Streams have eroded gentle depressions in the Liassic clays and formed the vales of Gloucester, Evesham, Belvoir, and Catmose, all of which are well known for their wooded character and their green pastures. But the relief of the red plain of the Midlands does not consist entirely of gentle undulations, for here and there rise steeper and bolder features. In some places hard masses of sandstone or conglomerate appear on the surface amidst the marls and give rise to picturesque sites like the rock on which Nottingham Castle stands, to lonely heaths like Cannock Chase, and to wooded heights like Sherwood Forest. In other places 'islands' of ancient rocks crop up through the plain itself, bringing the old buried rocks back to the surface for a space. In such areas occur little wooded stretches of high, rugged ground in which the soil is poor and which, though formerly repellent to man, are today nearly always coal-mining centres. Such are Charnwood Forest, the coalfield near Tamworth and Nuneaton, and the Staffordshire coalfield between the Trent and the Stour. The charm of the Midland scenery is due to the contrasts between the hills, escarpments, and isolated heath-clad or wooded heights on the one hand and the verdant depressions with their fertile soil and their swarms of villages set in orchards and green fields on the other.

To the east of the Midland Plain the structure brings to the surface the beds of Jurassic limestone which rise up in a long line of almost continuous scarped hills from the Bristol Avon to the Tees. In the Cotswolds the escarpment attains a height of 1070 feet and commands the Severn valley. It then passes through Warwick-

PLATE XLI



[Photo: Lupton, Bradford.

A. THE CHALK CLIFFS OF FLAMBOROUGH HEAD, YORKSHIRE



[Photo: A. Demangeon.

B SCENE IN NORFOLK
Ranworth Broad appears through the trees.

[To face page 264.

PLATE XLII



[Photo: A. Demangeon.

A. THE WITHAM AT WADDINGTON BRIDGE

This view of the district south of Lincoln is typical of a river flowing through flat country.



Photo: M. N. R. Jackson.

B. THE OUSE NEAR ST. NEOT'S

A quiet, charming scene. The river follows a sluggish course over a flat district.

shire under the name of the Edge Hills, but becomes fragmentary in Northamptonshire and Rutland. At Lincoln the Witham has cut a transverse gap through it. It disappears under the Humber, to rise again in the Yorkshire Moors, where it reaches a height of 1427 feet. In the Cotswolds the escarpment looks west and presents a massive and imposing face which is commonly known as the Edge. This term often recurs in the names of villages, *e.g.*, Wotton-under-Edge, Weston-sub-Edge, etc. In some places the escarpment has been eroded into huge terraces, whilst in others it is scalloped into rocky bluffs or carved into hill-forms. Its face is scored with narrow ravines whose sides are clad in beech or pine. On the barren limestone surface of the plateau above, bare rock appears through the soil at every step and walls replace hedges. The dreary, treeless countryside of this district contrasts with the wooded scenery in the depressions below.

Between the line of wolds and the series of hills which accompany the chalk outcrop farther east, the Jurassic and infra-Cretaceous clays form a number of wide depressions. These clays, which are used by scores of brick and tile works, give heavy compact soils on which grass grows well. The fresh green depressions form a number of wooded rural vales, *viz.* the Vale of Blackmoor, the Vale of Pewsey, the valley of the Bristol Avon, the Vale of White Horse, the Oxford Basin, and the Vale of Aylesbury. Towards the North Sea this belt of lowland widens out and falls away to such an extent that it has been partly drowned by the sea. The low-lying alluvial, peaty flats known as the Fens mark the former area occupied by the invading waters which are now confined to the broad, but shallow and gradually disappearing, bight of the Wash.

Farther east the chalk outcrop in its turn forms a striking line of hills whose bare brows are popularly known as downs. To the south of the Thames, the Berkshire Downs face northwards in a continuous escarpment which at times exceeds a height of 1000 feet and rises more than 650 feet above the Thames valley. The steep slopes are unfavourable to cultivation and are covered with short grass and dotted with juniper bushes. On the top of the plateau the silicious clay forms a pebbly soil which must be freed from stones before it can be tilled and often gives rise to rabbit-infested heaths. North of the Thames the chalk escarpment is nearly as high and under the name of the Chilterns runs continuously as far as the neighbourhood of Hitchin. But its hills are less bare and compact, and it is pierced by a number of gaps through which pass railways radiating from London. In Cambridgeshire and Norfolk it is scarcely distinguishable, but beyond the Wash it reappears in the Lincoln Wolds and Yorkshire Wolds (see Plate XLI).

The chalk dips towards the east under the thick layers of sand and clay which alternate transgression and regression of the Tertiary seas deposited in quite recent times in the Thames basin and on the East Anglian coast. The oldest of these loose sediments belong to the early part of the Tertiary epoch and fill the London basin. They consist of London clay, are more than 300 feet thick, and were formerly covered with extensive forests, traces of which still survive in Epping and Hainault Forests in Essex. The gentle undulations, parks, fine trees, and green grass of these formerly wooded areas now afford fresh, quiet spaces into which the suburbs of London are spreading round its northern perimeter. Mention should also be made of the beds of sand which survive on isolated hills outside London at Harrow, Hampstead, and Highgate, and also the beautiful country at Epping, High Beech, Brentwood, and Weeley in Essex. Another series of sediments of the more recent Pliocene epoch covers the chalk and forms a fringe sometimes as wide as 20 miles along the North Sea coast from the Stour valley in Essex to Norfolk. It is a complex bed of sand, gravel, clay, and shelly sand which has been deposited on the coast by the recent transgressions of the North Sea. This loose material, which is sometimes overlaid by alluvium or glacial drift, gives a uniformly flat surface and mingles together in a relief which is almost featureless.

2. THE MIDLANDS

The name Midlands is applied to a portion of the English Plain which has no precise natural boundaries, but exists in men's minds as a very real idea. In certain directions various ranges of hills may be regarded as the boundaries. These are on the west the mountains of Wales, on the north the Pennines, and on the south the limestone escarpment of the wolds. But between these peripheral barriers the Midlands run into the adjacent lowlands and fuse gradually into the plains of the Severn, Nen, Trent, Weaver, and Dee.

In a country which is deeply indented with estuaries and other inlets the Midlands are essentially an umbilical region removed from the sea and without ports. They have been distinguished in popular language for centuries, the term 'Midlands' being found in records of the 13th century. With the idea of central position is combined that of open plains or strips of lowland which present no obstacle to communication. The low relief makes the Midlands a region of great routes connecting northern and southern England. Railways form a close network, and formerly the London and North Western, the Great Northern, the Midland, the Great Central,

the Great Eastern, and the Great Western railways competed with each other here.¹ A whole system of canals connects up the estuaries on the east and west coasts. Formerly the region was crossed by Roman roads and later by great highways which led from one end of the island to the other. The Midlands formed the nodal point of converging routes, contained many fortresses, and witnessed scores of battles. No region in Britain possesses a greater number of old historic cities, castles, or cathedrals. With the name Midlands is associated the idea of fecundity and well-being. The fertile soil was once covered with crops and, though much of it is now under woodland or grass, it still produces large quantities of grain. It also contains a plentiful supply of coal in its four coalfields, on which Britain's great iron industry was built up around Birmingham.

RURAL LIFE IN THE MIDLANDS. Except on the heaths and wooded areas in certain rocky districts in Warwickshire and Staffordshire, the soil in the Midlands is heavy, clayey, and difficult to plough; but nevertheless it has long been marled and improved, and it produces excellent crops of wheat. Up to the end of the 18th century agriculture was nearly always based on the old triennial system of rotation, consisting of two corn crops followed by a year of fallow. At that time the whole of south Warwickshire was still an expanse of open agricultural country. But during the 19th century the whole region tended to revert to grass and pasture. The change is far more marked in the damper and more maritime west than in the drier, warmer, and more continental east. In the counties of Leicester, Rutland, Northampton, Huntingdon, and Bedford, which border the corn-producing eastern districts, there still survive large agricultural areas which are worked by means of farm machinery and bring forth crops of wheat and barley.

But elsewhere the trend towards pasturage is increasing and prevails in every farm. In Leicestershire, Warwickshire, Shropshire, Worcestershire, and Gloucestershire permanent pasture covers more than half the total area and has more than twice the acreage of the agricultural land. The whole countryside is an immense grass field used either for pasture or hay. In Staffordshire the arable decreased in area by 70 per cent. between 1794 and 1910, whilst the area under pasture increased fourfold.

Throughout the region livestock is the chief source of rural wealth. The farms produce meat and milk. Cattle imported from Ireland and Wales are fattened on the luxuriant pastures; and

¹ In 1921, the L.N.W.R. and the M.R. were amalgamated into the London, Midland, and Scottish Railway Company; and the Great Northern, Great Eastern, and Great Central became the London and North Eastern Railway Company. In 1948, they all became part of British Railways.

calves, pigs, and sheep are reared to supply meat for the great towns. But now that chilled meat is imported from abroad, dairy produce is found to be both safer and more profitable ; and the farms aim at producing a supply for London, Birmingham, Northampton, Leicester, Nottingham, and Derby. The commonest type of farm in the Midlands, therefore, concentrates on dairying. It often contains more than 250 acres and devotes two-thirds of its area to grass. Some districts specialise in the production of cheese, as, for example, the country around Chester, the Vale of Berkeley along the Severn estuary in Gloucestershire, and, best known of all, the series of villages in Leicestershire which make the famous Stilton cheese. Cheese fairs are held at Melton Mowbray and Leicester.

Other well-sheltered districts concentrate on the cultivation of fruit and vegetables. The Vale of Evesham, which lies in Worcestershire and is drained by the Warwickshire Avon, is regarded as the garden of central England. Its light, sandy soil and mild climate enable the smallholders to grow asparagus, tomatoes, cucumbers, onions, cabbages, and peas. With the market gardens are associated beds of strawberries, gooseberries, raspberries, and hops, together with orchards containing plum, pear, and apple trees. Between May and September special trains are run every day to carry the produce of this fertile district to all parts of the country. The fruit which is not sent to market is used for jam-making in big local factories.

The rich agricultural belt is continued in various directions through the Midlands. Up the Severn valley it reaches the Bewdley district, which is dotted with little farms, each with its cherry orchard surrounded by a bank of earth. Down the valley it runs as far as Cheltenham and Gloucester and the pretty villages which brew a famous brand of cider. It recurs again in the Trent valley above Newark, where the countryside is a mass of fruit trees. The variety and abundance of its agricultural produce make the Midlands a most prosperous region. But the fruitfulness which results from the good quality of the soil, together with man's labour, would certainly have had less effect but for the development of a number of large towns which have provided the necessary markets.

TOWN CLUSTERS IN THE MIDLANDS. The Midland valleys contain rows of towns situated near river crossings and confluences and on the banks of the streams whose courses were formerly important routes. Every basin has its own towns, to reach which one merely has to travel along the Severn, Avon, Trent, or Nen. On the western border of the Midlands the Severn leads into the heart of Wales or to the Bristol Channel. From ancient times these routes have fostered towns. Shrewsbury (pop. 32,000), situated on a peninsula

surrounded on three sides by a loop in the Severn, was originally an English stronghold intended for defence against the Welsh. For centuries the town guarded the troubled Marches and acted as a focus of trade relations between the Welsh mountains and the English Plain. Picturesque memorials of the distant past survive in its castle, its walls, its old church, and its narrow streets which are lined with timbered houses. The strategic value of its position remains today in the importance of its railway station, which is the junction of lines running from the Midlands to Wales and from Bristol to Lancashire.

On leaving the Plain of Shrewsbury the Severn passes through a series of narrows which were formerly guarded by Bridgnorth. This old fortress is now merely a little town with 5000 inhabitants and some carpet manufactures. Farther downstream stands a fertile plain dotted with towns, most of which are very ancient. Kidderminster (pop. 29,000), near the inflow of the Stour into the Severn, has given its name to a make of carpet. Droitwich (pop. 4,500) is noted for its salt springs ; but the largest of this group of towns is Worcester (pop. 50,500), which was formerly a Roman station and has been a bishopric since the 7th century. Damaged again and again by the wars of the Middle Ages, it now acts as a rural centre and especially as a market for hops ; and it has several flourishing industries derived from the products of the soil, viz. gloves, boots and shoes, and vinegar. Tewkesbury (pop. 4,300), an old town at the inflow of the Warwick Avon into the Severn, still preserves its beautiful 13th-century abbey. Cheltenham (pop. 49,000) lies on the banks of the Severn at the foot of the Cotswolds and owes its prosperity to the mineral springs discovered there in 1714. It is a spa and summer resort and a pleasant residential town with some well-known schools.

The Severn estuary begins at Gloucester (pop. 53,000). It was only natural that a town should grow up near the lowest bridge across a tidal river which penetrates into the heart of England, and in ancient times the present site of Gloucester was occupied by the Caer Loyw of the Britons and the Glevum of the Romans. In spite of its exceptionally good position, which corresponds to that of the great estuarial seaports, and in spite of its rich and densely populated backland, Gloucester has never reached the highest flights of prosperity, for it is difficult to approach from the sea on account of the winding character of the lower Severn and the strength of the tidal streams. The year 1827 saw the completion of a ship canal which shortened the distance to the sea from 28 miles to 16. Its depth of 18 feet enables vessels of 1200 tons to reach Gloucester. Sharpness, an outport at the mouth of the canal, can

be reached at high tide by ships of 5000 tons. The inward trade comprises mainly cereals and wood, but there are scarcely any exports. Most of the goods from Birmingham and the Black Country pass through other ports, and the railways lead to the better-equipped docks of Liverpool, London, and Southampton.

From the Severn the Warwickshire Avon, with its broad vale spreading out in the Midlands, leads by historic routes to the basins of the Trent and Wash. The valley contains swarms of old towns and places famous in national history. Evesham (pop. 8,800) is now a fruit-growing centre. Stratford-on-Avon (pop. 11,600), which is mentioned as early as the 8th century in a Saxon charter, is a market town and the birthplace of Shakespeare, thousands of whose admirers visit it annually. Warwick (pop. 13,500) is an old town, having been a British settlement, a Roman station, and a medieval castle town. Leamington (pop. 30,000) has sulphur springs which are used for medicinal baths. Rugby (pop. 24,000) was formerly an old route-stage on the high-road leading from the lower Thames across the Midlands to Northampton and is now a junction of several railway lines. Coventry (pop. 167,000 in 1931) has grown into the largest town in the Avon valley. Beginning as a monastery founded in the reign of Knut, it was until modern times merely a weaving village, whose past history is still recorded in its narrow streets and its timbered overhanging houses. At the beginning of the 18th century French Huguenot emigrants introduced the manufacture of ribbons and watches. Like Derby, Leek, and Macclesfield, the town continued to manufacture silk so long as it was not faced with French and Italian competition; but a certain quantity of ribbons is still produced, and with this is associated the manufacture of rayon. The watch-making industry was overthrown by the competition of cheap Swiss and American articles. From 1875 onwards the craftsmen gradually turned to the manufacture of bicycles, then to that of motor bicycles and cars, in which an enormous number of firms are now concerned. These new industries have attracted other similar ones, including machinery, sewing machines, and wireless sets. The town, in which Daimler made his first motor car in 1896, has now become one of the chief British centres of iron foundry, bronze work, motor cars, and motor engines; and the most southerly coal mines in Warwickshire coalfield have been sunk in the neighbourhood. Owing to its adaptability and to the proximity of several coalfields, Coventry has developed into an industrial town whose population of close on 200,000 souls has increased threefold since 1880.

Northampton (pop. 92,000) is situated on the banks of the Nen, which empties into the Wash. Like Coventry, it belongs to a cluster

of Midland towns which have existed since the earliest historical times. It is very ancient, has witnessed many battles, and was thrice the scene of parliaments held in the Middle Ages. At one time it was a mere market town, but, being situated in the centre of a stock-raising district, it soon began to manufacture leather goods. This was the origin of the boot and shoe industry which now employs thousands of workers. The same industry spread to the neighbouring little towns of Wellingborough and Higham Ferrers, but the presence of a large industrial town has not destroyed the rural charm of the county or of quiet, pretty little places like Market Harborough, whose only excitements before 1914 were afforded by well-attended fox-hunting meets in winter. But here and there among the peaceful fields unusual activity is to be observed near reddish holes in the ground. These are the iron mines which have been sunk into the foot of the oolitic limestone hills. This mining began near the coast at Cleveland, but afterwards transferred its operations to the virgin beds of the Midlands. In consequence, large metal industries sprang up round Northampton. In 1913 Northamptonshire produced 18 per cent. of the output of ore in the United Kingdom; in 1936 this percentage rose to 26. Blast furnaces were established at Wellingborough, Kettering, and at Corby, farther north, where there are also steel works. In 1929 Wellingborough despatched to other metal-working centres in the Midlands, Scotland, and even on the Continent nearly 60,000 tons of pig iron. Kettering has become a very busy industrial town, and its population had risen to 31,200 in 1931. Its metal industry is carried on side by side with the manufacture of hosiery and ready-made clothing. Metal works have also been established at Northampton, where heating apparatus, machinery, and tools for the boot and shoe industry are produced.

In the basin of the Trent and those of its feeders, the Sud, Sow, Tame, and Soar, there are the same facilities for communication across fertile areas, and here again these conditions have given rise to many towns. Old defensive sites which once played their part in the Danish wars formed the nuclei of the counties of Leicester, Stafford, Derby, and Nottingham, where the towns have all been ancient strongholds. They are, however, by no means dead, for there is coal at their gates, and modern industry has invaded them all. Two coalfields belong wholly to the district: that of Leicestershire, which is small, but rich, and outcrops to the south of the Trent near Ashby-de-la-Zouch; and that of Warwickshire, which outcrops to the south of Tamworth for some 12 miles around Atherstone and Nuneaton. These towns on the Trent do not cluster in conurbations as do those on the great coalfields and

in the main industrial districts, but keep their local individuality and independence. Stafford (pop. 29,000) is built on a hill commanding the Sow valley and formerly guarded the route from the Midlands to Chester. Large boot and shoe manufactures represent its present-day industrial activities. Lichfield (pop. 8,500), which was a focus of roads in Roman times and later a great episcopate in the kingdom of Mercia, now leads the peaceful life of a cathedral town. A Norman castle marks the former strategic importance of Tamworth, whose population numbers 7,500. Ribbon factories have brought Nuneaton (pop. 46,000) under the influence of Coventry. Although Burton-upon-Trent (pop. 49,500) grew up around an 11th-century abbey, it owes its present prosperity to its breweries. The excellent water derived from the red marls of the Trias and the enormous market afforded by London have given Burton the same kind of leading position in the brewing industry as is held by Bradford in the woollen industry and by Sheffield in cutlery. Leicester (pop. 239,000), on the Soar, is on the site of the Roman *Ratae*. With Derby, Lincoln, Stamford, and Nottingham it was one of the 'five boroughs' taken from the Danes by the West Saxons in the 10th century; and later the Norman kings built a castle there. Its medieval buildings bear witness to its continued commercial and industrial activity; but its modern expansion dates from the Industrial Revolution. For ages it worked up the high-grade wool produced by the sheep which graze on the limestone ridges in the county, but later it specialised in hosiery, in the production of which it is now almost unrivalled. Its skilled labour has also adapted itself to other forms of manufacture, including lace, elastic webbing, boots and shoes, and machinery.

BIRMINGHAM. Around Birmingham has grown up an entirely new type of human community. It lies outside the broad vales in which town life began on fortified sites in the earliest period of human movement in the island. This modern conurbation, which is the product of the Industrial Revolution, sprang up on a coalfield whose district goes by the name of the Black Country. The name Birmingham is of late appearance. In Norman times the place was a village in a clearing in the Forest of Arden, and the first mention of its church dates from 1285. Its neighbourhood lay among the heaths, woods, and rocky hills of the Midlands and was avoided by the highways. Fortune smiled on it from the 16th century, when the iron industry took its rise there owing to the abundance of ore and wood. As early as 1538 John Leland speaks of the smiths of Birmingham. In 1607 Camden described the town as a hive of industry which re-echoed to the ring of anvils. From the 18th century on-

wards the importance of the industry increased with the use of coal. The South Staffordshire coalfield stretches for 22 miles from north to south, from the heights of Cannock Chase to the Clent Hills, and from Rugeley to Bromsgrove. A seam of high-grade coal 30 feet thick and known as 'Ten Yard' was worked for years in the neighbourhood of Dudley, Bilston, and Wolverhampton. Though it is now exhausted, it then gave the factories a matchless advantage. Later prospecting brought the discovery farther east and north of underground reserves which will largely compensate for the exhausted seams. Another advantage put the finishing touch to this good fortune, namely the presence of beds of iron ore interspersed, as in Scotland, between the coal measures.

Birmingham's metal industry is a wonderful instance of evolution due to changing economic conditions. Until near the second third of the 14th century it included the whole range of iron manufactures, from the heaviest to the most delicate articles. The factories turned metal into nails, bars, and rings as well as into weapons, knives, locks, padlocks, and various forms of ironmongery. From the 17th century onwards the large-scale manufacture of toys made Birmingham the world's toyshop. From producing steel and even silver buckles for hats and shoes the firms turned, with the changes of fashions, to making buttons of steel, gold, silver, brass, wood, ivory, horn, and glass, hundreds of millions of which were manufactured every year. Then, from 1776, when James Watt had established his factory in the Soho district, the firms gave their attention to steam engines, which they turned out in thousands to be sold in England or on the Continent. A little later they passed to the manufacture of brassware, chandeliers, lamps, lanterns, candelabras, and a whole host of light, delicate articles. By the end of the 18th century and the beginning of the 19th, Birmingham was flooding the entire world with its manufactured goods. In this period, which lasted from 1785 to 1860 and may be called the age of malleable iron, the use of coke and the invention of puddling enabled cast-iron goods to be made on a large scale. The Birmingham district became one of the world's most important centres of the industry, producing delicately-made articles as well as cast and pig iron. To the British output of these two materials the town contributed 12 and 33 per cent. respectively in 1860.

But at this point Birmingham began to suffer certain drawbacks. At the end of the 18th century the destruction of the forests had caused a dearth of wood fuel. Local ore now became insufficient, and supplies had to be imported from Sweden. To pay the cost of transport, manufacture was obliged to turn to finished goods which required more skill and were of higher value. This change of

affairs increased during the last quarter of the 19th century. The distance of Birmingham from the sea is another serious handicap, for the town can neither send nor receive goods except by rail. In 1886, the Black Country produced only 4 per cent. of the pig iron used in Britain. Hence the iron industry has specialised more and more in the manufacture of goods whose cost of transport forms only a small part of the price. Consequently, the factories which are grouped together in Birmingham and its satellites produce pins, needles, metal pens, small-arms, buttons, ornaments, bells, fish-hooks, iron bedsteads, ironmongery, machinery, screws, medallions, and coins. Articles are also made of copper, bronze, silver, and gold ; and glassware and chemical products are added to metal goods. In fact, the Birmingham district is giving up more and more the production of primary products and heavy finished goods to which it owed its former reputation, and is turning to the manufacture of articles of complicated workmanship which require both technical skill in the making and perfection in the finishing processes. Its manufacturers have also fully realised the new wants created by the rapid rise in the standard of living among the masses of the people. Hence, the district has led the way in the amazing development of new industries, viz. the manufacture of motor cycles and cars, electrical apparatus, machine tools, weighing and measuring machines, and wireless sets. To these must be added rubber and rayon goods, office fittings, and certain foodstuffs. This vast quantity of goods is produced chiefly with a view to export, for no industrial centre in Great Britain depends more on foreign markets than does Birmingham.

The whole Birmingham district is one huge workshop, a veritable Black Country, in which everything is smoke-grimed. Conical slag-heaps rise at every turn, and trees and clean water have disappeared. Human life depends wholly on iron and coal. Birmingham grew very quickly, spreading out along the canals leading to Worcester, Warwick, Wolverhampton, and Tamworth, which supplied its requirements in coal and ore. Its population rose from 15,000 in 1700 to 73,000 in 1801, from 225,000 in 1850 to 400,000 in 1881, from 759,000 in 1901 to 1,002,000 in 1931, and in 1936 the estimated population of the town and its suburbs was 1,300,000. Around Birmingham, and particularly on its western side, there is a dense cluster of towns, each of which shares in the vast industry of the district. Wolverhampton (pop. 133,000) manufactures bicycles, motor cars, tin goods, locks, enamelled iron ware, and coal buckets ; Walsall (pop. 103,000) ironmongery, harness and saddlery, and coal ; West Bromwich (pop. 81,000) ; Wednesbury (pop. 32,000) rails, axles, and wheels ; Bilston (pop. 31,000) heavy metal goods ;

Dudley (pop. 60,000) screws, anvils, and vices ; Redditch needles, pins, and fish-hooks ; and Stourbridge fireproof bricks for blast furnaces (see Fig. 64).

Next to Manchester, Birmingham is the most important industrial centre in England, and the influence of the wealthy town extends over much of the surrounding country. During the rapid growth



FIG. 64. The Birmingham Conurbation.

1. Railways. 2. Canals. Note the large number of satellite towns.
 — — — Boundary of the City of Birmingham.

of the town some of its older quarters with their narrow, irregular streets escaped the general reconstruction. But, as a whole, the place has either been rebuilt or newly built with straight streets, wide main thoroughfares, and substantial houses. An aqueduct 90 miles long or more brings pure water from a valley in Radnorshire. Since 1900 it has had a university which pays special attention to the study of the science of applied metallurgy.

Birmingham has adapted itself to modern industrial conditions, and the working classes have suffered far less from unemployment there than in any industrial region in the north of England or Scotland. The great town can claim much of the responsibility for the new direction the British economic system is taking. In 1885 a Royal Commission, which enquired into the slump from which the Birmingham metal industry was then suffering, protested against foreign competition and the protectionist tariffs which obtained abroad, and even at that date suggested an economic union between Great Britain and her Dominions and Colonies. Joseph Chamberlain, who was Mayor of Birmingham and who represented the town in the House of Commons, was the great champion of Imperialism, and the spirit of the Ottawa Conference may be said to have been inspired to some extent by Birmingham.

3. THE FENS

The great alluvial plain of the Fens presents a most peculiar aspect of English scenery (see Plate XLIVc). Across it flow the sluggish streams of the Witham, Welland, Nen, Great Ouse, and Cam on their way to the sand-choked Wash. Its length from Lincoln to Cambridge is 62 miles, and its breadth varies between 25 and 40 miles. Its embankments, dykes, canals, and its low and peaty surface give it a resemblance to Holland. In fact, the damp, low-lying area in the south of Lincolnshire bears the name Holland, like its counterpart across the North Sea. The same features appear in the landscapes of the two countries, viz. the flatness of the ground and the vast spread of the horizon, the network of canals and streams which form geometrical patterns on the surface (see Fig. 65), the lines of tall poplars and the willow brakes screening thatched roofs, the unruffled sheets of water fringed with reeds and rushes over which passes an occasional boat laden with peat, the infrequent wind-pumps, and the rich play of light on the somewhat misty atmosphere.

The Fens occupy the former extension of the Wash which is now filled in with gravel, fen-peat, and clay. Here, as in the Netherlands, the land has had to be reclaimed before it could be peopled and used. Protection against the sea has not called for so much effort as it has done in Holland, because the rivers do not open such huge breeches in the coast as they do in Flanders and Zeeland. A very ancient sea-dyke runs for a distance of more than 50 miles from Wainsfleet through Boston, Spalding, Holbeach, and Wisbech to King's Lynn. Beyond this original line of defence an area of more than 115 square miles reclaimed from the Wash is enclosed by a

network of dykes which have been built one by one during the past centuries. Sluices control the entry of the tide up the several rivers, and, except in the main Ouse channel, direct contact between sea and fresh water has been cut off. The work of draining off the fen water was far longer and more difficult. The first attempts were made by the medieval monasteries, but there was neither co-ordination nor organisation until the beginning of the 17th

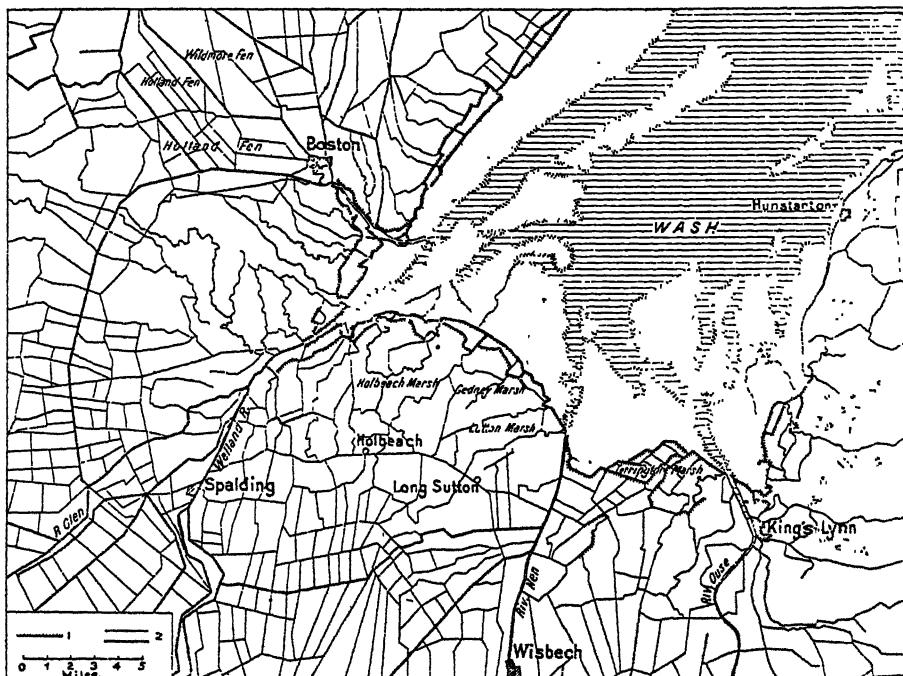


FIG. 65. The Fens and the Wash.

1. Dykes.

2. Canals.

century. The most extensive operations took place between 1628 and 1653 in the basins of the Nen and Great Ouse, where a company under the control of successive Earls of Bedford, and advised for many years by a Dutch engineer named Vermuyden, succeeded in draining an immense area which goes by the name of the Bedford Level. But much remained to be done. The work was continued during the 18th century and was furthered by the enclosure movement which brought into private ownership the remaining common lands in the district. A series of laws compelled the parishes to

build canals and dykes across the Fens, and by 1851, when the Whittlesea area was drained, no large expanse of water persisted.

The Fens are now a small edition of the Netherlands and have been drained and kept dry by artificial means. Steam engines work the pumps which remove the water from the more low-lying tracts ; whilst the level of the water in the ditches and canals is regulated by sluice-gates and locks. For centuries the works were maintained by local bodies known as Commissioners of Sewers, the members of which were drawn from among the landowners. These Commissions were similar to those which look after the dykes and drainage machinery in the Dutch and Flemish polders. Courts of Sewers supervised the collection of dues, appointed inspectors, collectors, and supervisors, and decided on the work to be done. The system was much the same as in the *wateringues* of Flanders. Its weakness was a lack of co-operation between the local Commissions. Hence, under the Drainage Act of 1930, Catchment Boards were set up, each with exclusive control over a main river and with supervisory powers over internal drainage authorities. The new Boards were empowered to levy rates over the whole of their respective catchment areas. Thus came into being the Catchment Boards of the Great Ouse, Nen, Welland, and Witham (and Steeping).

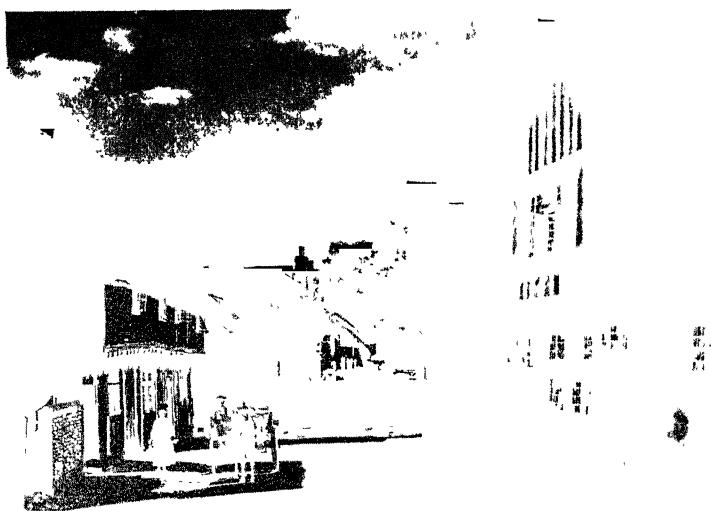
The change in natural conditions has resulted in a far-reaching transformation of the economic system, for this land of fen and peat-bogs has become a rich agricultural area. The marine alluvium has become heavy, but very fertile, soil ; and the fen peat, when improved with marl, has been turned into light, friable, and easily worked land. Whilst in nearly the whole of England smallholdings have decayed because of slumps in agriculture, they have maintained themselves in the Fens, and today they form a peculiar feature of the local social system, a feature which has proved to be of direct value. In the Parish of Leake, for instance, the average area of a holding does not exceed 25 acres ; whilst at Moulton 180 out of 230 landowners have holdings of less than 50 acres each. The system of tenure and of farming entails a special type of skilled labour which readily takes to intensive cultivation and to the growing of a variety of produce. Vegetables are grown round Spalding and Boston, whilst the district round Wainfleet, Boston, Spalding, and Holbeach is the chief potato-producing area in England. The whole Wisbech district is one huge orchard in which fruit trees grow side by side with gooseberry and raspberry bushes. Fields of onions, cauliflowers, asparagus, and strawberry bushes alternate with gardens containing narcissi, tulips, hyacinths, crocuses, pansies, violets, and other kinds of flowers, thus forming a scene which resembles Holland on the one hand and Kent and Jersey on the

PLATE XLIII



[Photo: A. Demangeon.]

A. A COUNTRY LANE IN SUFFOLK, NEAR BURY ST. EDMUNDS



[Photo: The Times.]

B. HALF-TIMBERED HOUSES AT LAVENHAM IN SUFFOLK

[To face page 278.]

PLATE XLIV



[Photo M. N. R. Jackson.
A. THATCHED COTTAGES IN
ESSEX



[Photo M. N. R. Jackson.
B. BROUGHTON CASTLE,
OXFORDSHIRE



[Photo. A. Demangeon.
C. THE FENS NEAR HADDENHAM, ISLE OF ELY

other. In recent years a great sugar-beet industry has sprung up under the influence of a Government subsidy.

Inside the Fen district little towns like March, Wisbech, Spalding, and Ely occupy raised, well-drained sites formed by the gravel and clay islands which lie scattered about in the Fens. Ely (pop. 8,400), which stands on a hill formerly surrounded by water, was one of the last English strongholds to resist the Normans. It became the see of a bishop in the 12th century, and its magnificent cathedral survives as a relic of the glorious past, lifting its towers from amidst a cluster of ancient trees as a landmark which in clear weather can be seen from all over the surrounding flats. On the edge of the Fens a number of towns stand at the line of contact between the flat land and the higher ground which surrounds it. They are either route foci or market towns and include Stamford, Huntingdon, and St. Ives. Peterborough (pop. 43,000) is naturally more important than these, owing to its railway junction and to the prosperity of its industries. It contains brickfields, breweries, machine shops (especially for making agricultural implements), and factories for turning out preserves, mainly mustard and tinned peas. But Cambridge (pop. 67,000) is the most important of all. It figures very early in history, because in the Middle Ages it was a port visited by small seagoing vessels ; and it was plundered more than once by the Danes. At the end of the 12th century the busiest fair in England was held at Stourbridge, where the Midlands, the Fens, and East Anglia meet near the Icknield Way which leads to London and Norwich. From Cambridge cargoes of wool and cloth were sent down the Cam to be shipped at King's Lynn. In this wealthy district, which contained many pious foundations and was favourable to landed estates, the University of Cambridge began its existence not later than the early 13th century. Today, the University is the mainstay of the town, on which its ancient college buildings and the beautiful Backs bestow a rare charm (see Plate XLVIa). Colleges line the grassy banks of the sluggish stream ; and backwaters, into which droop the branches of overhanging willows, run into the meadows under the shelter of ancient trees. The walls of the buildings are hidden by foliage. The luxuriant vegetation, together with the magnificent architecture, forms a peaceful academic setting for the studious life which goes on under the guidance of famous teachers. The existence of many sports grounds illustrates the place held by games in English education, and groups of overseas students indicate the influence which the Mother Country exerts over the whole Empire.

The Fen District now has little contact with the sea. For years the Wash offered a gateway into the Midlands, and in the Middle

Ages cargoes of grain from Lincoln went down the Witham to the Continent. At the end of the 14th century Boston was a wool market frequented by Florentine and Hanseatic merchants. But the silting-up of the bight has gradually driven the larger ships to other ports. Boston (pop. 17,000) is now merely a fishing port whose trawlers catch large numbers of sole on the fishing grounds in the Wash. At one time King's Lynn (pop. 20,000) fitted out whaling vessels, took its share in the transport of coal from Newcastle to London, imported French wines, and traded with the Baltic. Today, the little town, with its two docks and a moderately deep fairway leading to them, has a coastwise trade and imports wood, sugar, and cereals. With the growing industrialisation of the south Midlands Boston and King's Lynn have begun to export a certain quantity of metal goods. Outside the two channels through which trade passes to them peace and quiet reign over the sandy shores of the Wash. Many poor folk earn their living on these shores, however, by collecting mussels and shrimps. But there are no villages on this lonely coast, except in Norfolk, where the greater elevation of the coast has led to the growth of a series of seaside resorts at Hunstanton, Wells, Sheringham, and Cromer.

4. EAST ANGLIA

The wide plain of Norfolk, Suffolk, and Essex slopes gently down by an almost imperceptible gradient into the North Sea between the Thames and the Wash. It forms East Anglia, an intensely agricultural region which is the only one in Britain to resist the encroachment of stock-raising and the invasion of grass. In none of the counties is more than a third of the area devoted to pasture, a proportion which is also claimed by cereal cultivation. This peculiarity is due to the climate and soil. The geographical situation of the region removes it from the full influence of the ocean and brings it to some extent under continental influence. It does not suffer from the continuous rains which make the grass luscious, and in summer the sun is warm enough to ripen grain. The soil is fertile owing to the particularly thick and continuous mantle of glacial clay which covers the central parts of Norfolk and Suffolk, as well as the north of Essex. Rich and heavy, this soil contains a great deal of silica and chalk fragments, and is enriched by many different elements which have been finely ground by the ancient ice cap. The main features of the scenery are the shallow valleys, the red pebbly earth, the vigorous green copses of oak, beech, and ash (see Plate XLIII), the village ponds sheltered by willow and poplar, the timbered farmhouses with thatched roofs and flint facing.

THE COUNTRYSIDE. This fine region remains faithful to the plough. Here in the 18th century began the famous Norfolk system of a four-year rotation of crops, which is still in use almost throughout the region, since it seems the best adapted to local conditions. It consists of a successive cultivation of wheat, root-crops, barley, and fodder-crops. Wheat and barley do excellently, the former on the heavier soils, the latter on the lighter. They each occupy more than 10 per cent. of the total area. The large fields lend themselves to the use of farm machinery, and steam and motor ploughs are often employed. Up to the 20th century economic conditions largely prevented the intensive cultivation of industrial crops, which were widespread on fertile soils in Belgium, northern France, and Germany. But today the cultivation of sugar-beet has become important, and many refineries have sprung up in the neighbourhood of Norwich.

The raising of a large number of domestic animals is a marked feature of East Anglian farming. Huge fields of turnips, lucerne, sainfoin, and clover provide fodder, and there is not a great deal of pasturage. The attention of Norfolk farmers has for long been divided between getting high returns from the soil and the improvement of the breeds of animals. The famous Red Polled breed of cattle was established in the county about the year 1782. The quantities of fodder produced by the land admit of most profitable enterprises, such as the keeping of large flocks of sheep and the fattening of steers, which are bought in the grazing counties and sold to London butchers. The farms are very large and, besides maintaining great numbers of livestock, contain a huge acreage under cultivation. Many of them are 250 acres in extent, and properties of 1200, 2000, and even 2500 acres are by no means rare. The farmers are often wealthy and are thus able to employ gangs of Irish labourers hired for the season and to use every kind of farm machinery. They live in comfortable, and often luxurious, houses placed well away from the farm buildings and resembling manorial halls rather than the homes of cultivators. Such is the fertile, cultivated plain which occupies the good drift soil of central East Anglia.

As the mantle of drift grows thinner and less continuous towards the south, the scenery changes into the charming landscapes of heath and woodland which have been made familiar by Constable and Gainsborough. Wooded areas still survive. Epping Forest, situated between the valleys of the Lea and Roding, is an expanse of oak, beech, birch, and hornbeam, which is already being encroached on by the suburbs of London. But so far the charm of the countryside has not been destroyed, and there is an almost matchless

refinement and freshness about certain parts of Essex with their old abbey ruins, wooden churches, moated farmhouses, their once frequented inns, their little country towns with moss and ivy-covered walls, their villages with crumbling thatched cottages (see Plates XLIIIB and XLIVa), their heather and gorse-clad commons, and their great ancestral parks dotted with majestic trees. The scenery consists of varying little landscapes, in which charming pictures of rural life appear. Byres, poultry-yards, orchards, and gardens take the place of cornfields. This development is being hastened by the influence of the London market. Around Chelmsford, Witham, and Colchester herds of milch cows are kept, and the milk is sent to London every day. Other farms specialise in the growing of hay for the Whitechapel market. Even in western Suffolk the farmers tend to be influenced by the great London market. Burrowshall produces cabbages, eggs, and poultry; Lavenham turkeys, ducks, and geese; and Long Melford butter and cream. There is a continual increase of fruit and vegetable cultivation. Around Waltham Cross and Hockley grapes, tomatoes, cucumbers, and peaches are grown under hundreds of acres of glass. Near Witham are large beds of strawberry, gooseberry, and raspberry bushes; near Waltham, Colchester, and Epping are tree and shrub nurseries; and in other places there are beds of pansies, nasturtiums, poppies, and roses.

In East Norfolk a triangular area between Cromer, Norwich, and Lowestoft, which is some 20 miles at its widest, is known as Broadland on account of its many 'broads' or lakes. It was formerly a large bight into which flowed the Yare, Waveney, and Bure; but today it is cut off from the sea by a line of spits and dunes and has been almost completely silted up. Breydon Water, an estuary consisting largely of sandbanks exposed at low tide, is the only remnant of the former gulf. The sluggish streams which wander through the district expand here and there into broad sheets of water. The lower ends of their valleys are below the level of the high tide, which penetrates as far as Wroxham Broad and Norwich. The Broads themselves are shallow expanses of water covering peaty bottoms. These curious features of east Norfolk are gradually being silted up, but about three dozen still survive. The largest are Hickling (395 acres) and Barton (270 acres) Broads, though even these are now mostly overgrown with reeds. The peaty swamps, the still sheets of water hidden by reeds, the wide channels overhung by willows, and the lonely marshes frequented in winter by water-fowl exhibit Nature in all her wildness, loneliness, and melancholy. But in summer these solitudes are full of holiday-makers, and the Bure, Ant, and Thurne, together with Wroxham, Salhouse, and

Oulton Broads, are dotted with motor cruisers and sailing yachts. Many of the Broads are now shooting preserves. Away from the Broads and swamps, the ground is covered with grass and forms a rich pastoral district in which graze thousands of cattle. Green fields, grazing cattle, windmills, willow-lined channels, boats sailing among trees—all these remind one of the scenery in Holland (see Plate XLIIb).

TOWN LIFE. Associated with the country districts in East Anglia are many little market towns which also supply farm requisites. Of these Dereham produces fences and poultry-runs ; Thetford (pop. 4000) manufactures farm machinery and traction engines ; Bury St. Edmunds (pop. 17,000) turns out sowing and threshing machines, ploughs, and machinery for malthouses and breweries ; Newmarket (pop. 9,700) is the headquarters of the Jockey Club and trains horses for racing. Other towns are Sudbury, Halstead, and Braintree.

Along the coast are two series of towns which owe their growth to the contact of land and sea. The inner series consists of places at the heads of the estuaries and on main roads ; the outer series is situated on the coast itself. The towns on the estuaries are all placed near the head of the tidal water. Chelmsford (pop. 26,000), the county town of Essex, stands on the Chelmer ; Colchester (pop. 48,600) on the Colne ; Ipswich (pop. 87,000) on the Orwell ; Woodbridge on the Deben ; and Norwich (pop. 126,000) on the now silted estuary of the Yare.

Colchester, the ancient Camulodunum, was the first Roman colony in Britain, and was used as a port of disembarkation. In the Middle Ages it was a cloth-making town whose looms ran into thousands, and ships were still able to sail upstream to its very walls. When it lost its shipping and its textile industry it became a market for agricultural produce. But it has not wholly given up its connexion with the sea, for oyster fishing is carried on along the Colne as far as Brightlingsea, the oysters being despatched to the beds at Ostend. Later, industrial activity began under new forms, viz. printing and the manufacture of ready-made clothing and machinery, especially farm machinery and gas engines.

Ipswich was a busy port in the reign of Edward III and furnished twelve ships for the siege of Calais. Today it is associated with the agricultural district around it, manufacturing for it farm implements and machinery, manure, railway material, and electric motors ; it imports cereals, oil-seed, wood, steel, phosphates, and nitrates ; and it exports farm produce, manure, oil, and oil-cake. Woodbridge, which in the 18th century exported Suffolk butter, now carries on

a coastal trade, importing coal, wood, and oil-cake, and exporting grain, malt, and bricks.

Norwich was founded in very ancient times on the Wensum near its confluence with the Yare and was for long a port for sea-going vessels. In the 11th century a Danish fleet sailed under its walls, and in the 16th century it had a dispute with Yarmouth over the latter's refusal to grant free passage to ships. It is an old city with a Norman castle, a cathedral, and a bishop's see. It is a typical agricultural centre and has always lived for and by its region, weaving the wool from the surrounding country and acting as a market for its woollen cloth up to the time when the industry moved elsewhere. When this took place, the skilled labour which was thus set free was turned to other purposes, especially to those arising from agriculture. In the city there are now boot and shoe factories, workshops producing farm machinery and implements, and foundries which have been attracted to it by the presence of the workshops. It manufactures iron fastenings, mesh-wire, portable iron constructions, starch, beer, and mustard. On certain days of the week the countryside invades the city. The vast square just outside the castle is then divided up into compartments by iron hurdles and forms the cattle market (see Plate XLVB).

The series of towns which have grown up along the coast is of more recent formation. Some were once fishing villages, but since the construction of the railways have become seaside resorts. Such are Southwold, Aldeburgh, Felixstowe, Walton, Clacton, and Southend. Clacton has a delightfully bright, clear climate which is mild in winter and dry in summer. Geraniums will grow in the open even in winter. Harwich (pop. 12,700), which is an hour and a half by rail from London, is the terminus of a main line of the London and North Eastern Railway and a ferryport for passenger traffic to the Netherlands and Germany. Finally, Yarmouth (pop. 57,000) and Lowestoft (pop. 42,000) have grown up near the North Sea fishing banks and are now large towns with great fishing industries.

Yarmouth, at the mouth of the Yare, is the largest English town engaged in the herring fishery. Its activities in this respect were mentioned as early as Domesday Book. In 1108 the town bought the privileges of a borough with a yearly payment of 10,000 herrings. For centuries it has continued to profit by the regular appearance of shoals of these fish in the North Sea. When trawling came into practice, Yarmouth adopted the new method of fishing, and in 1883 it owned 700 trawlers. A Yarmouth firm introduced the use of ice for preserving the catch on board the boats and organised the fast transport of fish by special despatch to the London market. But

about 1900–1903 the trawlers moved to Lowestoft, and Yarmouth now concentrates almost exclusively on herring. The fishing season lasts from October to December, and the work is carried on by steam or sailing drifters. During this time the Yarmouth fleet is joined by Scottish boats, so that more than 800 vessels land fish at the town in the season. Their annual take forms two-thirds of the British herring catch. To the 2000 fishermen who man the boats must be added the employees of the installations which deal with the fish. Every autumn 5,000 Scottish women come to Yarmouth to salt and smoke herrings. During the off-season for herring in the North Sea, the herring-boats catch mackerel off the Irish and Cornish coasts, returning to Yarmouth for the great autumn season.

Lowestoft engages in fishing of a far more varied character. Its boats catch herring from the beginning of October up to Christmas, during which period they are joined, as are the Yarmouth boats, by Scottish vessels. The Lowestoft shore establishments also employ Scottish fishwives. From May to July mackerel fishing is carried on off the mouth of the Thames. But the prosperity of Lowestoft in modern times has been due to its trawlers, which catch the more dainty kinds of fish. In order that these may be supplied fresh to London and other towns, the former London and North Eastern Railway Company, which had constructed the harbour, organised a fast service of special trains. The number of trawlers registered at Lowestoft exceeds 300. As at Yarmouth, Hull, and Grimsby, fishing is a regular industry organised on a large scale with the best equipment. Before 1940 the annual catch at Yarmouth and Lowestoft together totalled 175,000 tons, whilst Grimsby and Hull landed 275,000 tons. During the war of 1939–45 fishing from Yarmouth and Lowestoft was reduced almost to nothing. Since 1945 the two ports have been well on the way to recovery.

5. THE BASINS OF THE THAMES AND OUSE

The portion of the English Plain which comprises the upper basin of the Great Ouse and the whole of that of the Thames is strangely similar to the Paris Basin in the arrangement of its strata in parallel or concentric belts—an arrangement which gives rise to a corresponding subdivision of the region and to much variety in the surface rocks. On examination the relief is found to consist of four belts which succeed each other from west to east. These are limestone plateaus, clay plains and depressions, chalk plateaus, and, lastly, plains and valleys of sand and clay in the London Basin. To this topographical series corresponds a succession of different methods of land utilisation and of type of human settlement.

Between the valleys of the Severn and the upper Thames rises the limestone plateau known as the Cotswold Hills, which reach a height of 1125 feet near Cheltenham. They fall abruptly away to the west where their escarpment is gashed by deep-cut valleys carrying clear swift-flowing streams. On its dry, rocky surface the plateau would be almost bare, but for the recent plantations of pines. Here and there survive areas of true grassland, whose short grass is dotted with wild flowers. Woods grow only on the slopes and in the gullies where superb beeches display their bright foliage. The grassy plateau, which resembles a vast area of downland, has long been favourable to sheep-rearing ; and as early as the Middle Ages the famous Cotswold breed used to supply wool to the warehouses in Cirencester, Northleach, and Chipping Campden, whence the London merchants despatched it to the Kentish ports for shipment to Calais and Flanders. Thus, local woollen manufacture grew up near the little streams which supplied water for washing the wool and turning the mills ; and it flourished till the middle of the 19th century. Now, however, it survives only in a few localities, *i.e.*, at Bradford-on-Avon, Trowbridge, and especially at Stroud, which are all famous for their worsteds. The mills are situated in the bottoms of cool, green valleys in a rural setting which contrasts strongly with the smoky atmosphere, dirty streams, and depressing moors of the West Riding. Except Chipping Norton (pop. 3500), which is a little market town on the plateau, the towns are all in the valleys at the edge of the plains. Malmesbury, Cirencester (pop. 7200), and Banbury (pop. 14,000) are market towns which produce farm requisites, the last-named having considerable engineering works.

From the limestone plateau the ground slopes down to the broad wooded valley in which all the little streams that form the Thames flow together. The surprising variety of outcrops of Jurassic and Infra-cretaceous beds of clays, marls, limestone, sandstone, and sands makes the valley not a plain, but rather a humpy, gently undulating district with a succession of low wooded hills, slopes dotted with trees and lined with hedges, and green, well-watered valleys. It was once a rich corn-growing district, but circumstances combined to turn it into a grazing area, *viz.* the vast expanses of clayey soil, wide valley bottoms through which streams meander natural meadows which yield fine crops of hay, and, finally, nearness to London, which gave assurance of an ever-ready market. Consequently, dairying is the chief occupation in the district. Butter is made on practically every farm, and the large number of milk cans sent to London from all the railway stations makes the lines a regular 'milky way.' Little towns swarm in the rich countryside Chippenham (pop. 8500) is a marketing centre for grain, butter, and

PLATE XLV



[Photo: Frith.

A. THE THAMES AT ETON

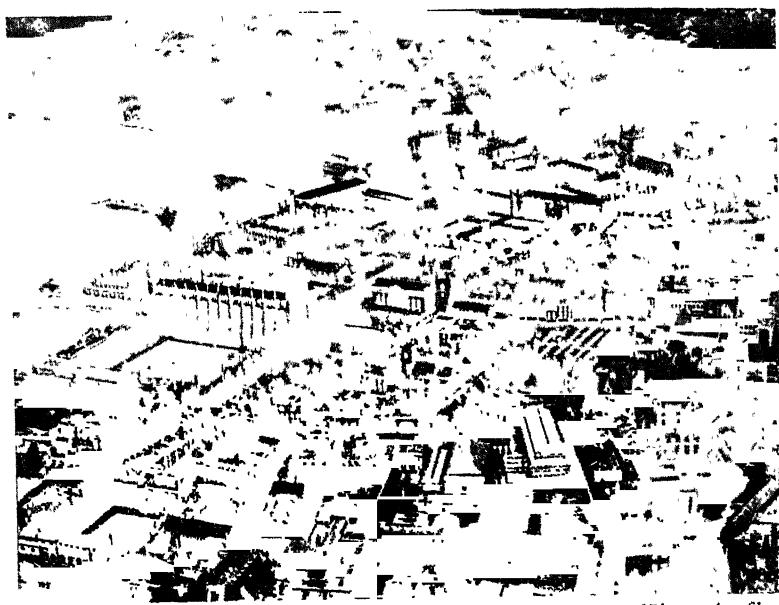


[Photo: Valentine.

B. THE CASTLE AND MARKET-PLACE, NORWICH

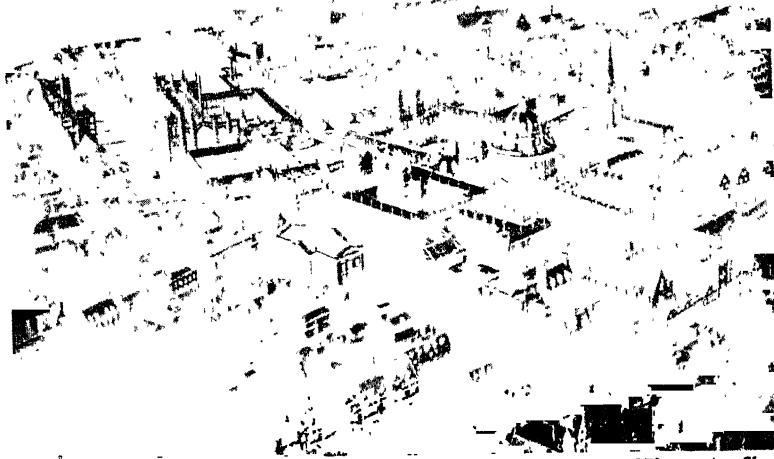
[To face page 286.

PLATE XI VI



[Photo: Aerofilms.]

A. VIEW OF PART OF THE UNIVERSITY QUARTER OF CAMBRIDGE
King's College Chapel stands out prominently. To the left of it is a glimpse
of the Backs.



[Photo: Aerofilms.]

B. THE UNIVERSITY QUARTER OF OXFORD

cheese and has recently taken to making railway signals ; Faringdon is a market for pigs ; Abingdon (pop. 7200) for grain ; whilst Aylesbury (pop. 13,400), the county town of Buckinghamshire, is famous for its poultry and dairy products. Buckingham has a population of 3000. Wolverton (pop. 13,000) on the Ouse employs over 5000 workmen in its railway yards.

Three towns, however, have a real individuality, namely Oxford (pop. 81,000), Swindon (pop. 62,000), and Bedford (40,000). Bedford is an old town on the Great Ouse and is the county town of Bedfordshire. It was a Roman station, then a Norman stronghold that withstood many attacks and sieges. It contains old churches and several big schools. A large factory for producing farm machinery represents the advance of the modern economic system into the quiet precincts of the old town. Swindon in Wiltshire is a very modern place, the creation of the Great Western Railway, which employs over 12,000 men in its immense locomotive and carriage shops.

Oxford, which is the county town of Oxfordshire, was founded in the swamps situated at the confluence of the Thames and Cherwell, and developed at first as a fortified stage on a route leading to the Midlands. But since the 13th century its life has merged into that of its university. Its churches, quadrangles, colleges, and its many old buildings call up associations with a glorious past (see Plate XLVI^B). Merton and Balliol Colleges date from 1266 and University College from 1280. The Bodleian Library was built by Thomas Bodley in 1597. Respect for tradition and established customs is visible throughout the city both in men and things. But in full term, when its 7500 undergraduates are in residence, the old city is full of life. Besides the study for examinations and research, there is also that thoroughly British feature of life—sports and recreations consisting of various forms of physical exercise, matches, and boat races. But for the presence of its undergraduates, Oxford, like Cambridge, would have seemed lifeless until quite recently ; but now industrial activity has invaded the traditional precincts of learning. The huge Morris motor-car works, which produce tens of thousands of cars every year, have been established in the suburb of Cowley. This has caused Oxford to grow, the increase in population between 1921 and 1931 amounting to 25 per cent.

When the Thames leaves these broad vales, in which its current is slowed down by wide meanders and braided reaches, it flows, before reaching Reading, between wooded slopes on which bare ridges of white chalk appear here and there. At this point the river passes through a range of massive hills known as the Marlborough Downs on the west bank and as the Chilterns on the east bank. In the

latter the chalk is mantled with glacial drift and the scenery assumes a fresh, wooded appearance. The splendid beech forests which adorn the little valleys formerly gave rise to the manufacture of chairs and other wooden articles in the villages ; but today this old industry survives only in the furniture factories at High Wycombe.

The influence of London pervades the district. It is seen in the tendency to produce commodities intended for the markets of the great city, such as potatoes, milk, vegetables, watercress, fruit, poultry, fat sheep, and fodder for the city's stables. Moreover, in the shadow of the mighty capital the only town life possible is that of small, long-established places which spring to life on market days, viz. Saffron Walden, Hitchin, which distils lavender grown in the neighbourhood, Hertford, which is the county town of its shire, St. Albans (pop. 28,000), which has grown up around an old abbey, Newbury, and Devizes. Reading (pop. 97,000), the county town of Berkshire, has outstripped its fellows, however. It has grown up on the banks of the Thames round a Benedictine abbey which was founded in 1121. Since its foundation it has always benefited from its nearness to London, having been at times chosen as the meeting-place of parliaments and being today drawn into the suburban sphere of the great city. Two large industries support a numerous population of workers, viz. Huntley and Palmer's biscuit factory and Sutton's nurseries, which produce and select seed for sowing.

On leaving Reading the Thames enters some charming rural country which is at times quite unspoilt, though it has to a large extent been affected by the outward expansion of London. Here, in the London Basin, Tertiary deposits of sand and clay bury the chalk of the Chilterns and Downs, and the river moves in wide meanders across the flat-bottomed valley. A number of brickworks and ballast-pits turn to account the clay and gravel of the alluvial deposits. The main valley is entered by half-marshy tributary streams which contain stagnant channels. Where the surface rock consists of sand there are barren, uncultivated heaths which are for the most part covered with heather, gorse, and broom, though plantations of pines occur here and there. This barren type of country is found at Woolwich, Hampstead, and all round the military camp at Aldershot. In former times the sandy areas were often wooded and were used as hunting grounds by the aristocracy. This was the origin of Windsor Castle, which was built as a shooting-box in Windsor Forest and afterwards became the famous residence of the Kings of England.

Where the surface is of clay the countryside is greener, the soil has long been cultivated, the fields are enclosed by hedges and lines of trees, and numerous woods appear. The expansion of London

has, so far, failed to engulf all the heaths and wooded areas, and agriculture is still carried on, usually on little farms which confine themselves to profitable work which demands skill and supplies the needs of the London market. Thus, hay is grown in Hertfordshire and Middlesex to feed the horses in London ; milk and orchard fruit are produced everywhere ; garden vegetables are cultivated in the Thames valley and early potatoes in Surrey and north Kent ; whilst tomatoes, cucumbers, and grapes are grown under glass in the Lea valley. But the district is being more and more rapidly overrun by the exodus from London, and the expansion of the area occupied by the vast city is covering it with parks, recreation grounds, and houses large and small. A swarm of towns like Romford, Harrow, Hendon, Wembley, and Ealing, which were formerly detached suburbs, have now become large integral parts of the city. On the north bank of the Thames Enfield, Watford, and

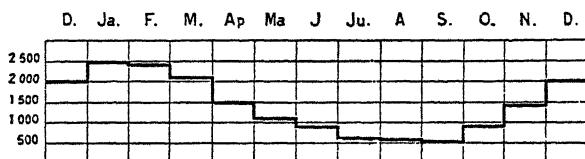


FIG. 66. Mean Volume of the Thames at Teddington, in Thousands of Gallons a Day.

Beaconsfield, and on the south bank Epsom, Leatherhead, Farnborough, and Basingstoke (pop. 14,000) still lie beyond the area of continuous urban development. Croydon (pop. 233,000), once the city's chief air-port, has not escaped however. Between London and Reading a busy, closely packed, and almost continuous line of towns along the Thames includes Kingston, Staines, Slough, Chertsey, Windsor, Maidenhead, Great Marlow, and Henley.

THE THAMES. The Thames flows as a quiet, modest stream through a succession of country districts between the Cotswolds and London. With a length of 196 miles from its source to the great city it drains a basin of 4155 square miles, or one-seventh of that of the Seine. It rises at an elevation of 370 feet near Cirencester and flows down a gentle gradient of 1 in 3000. At Lechlade, 15 miles from its source, it is only 246 feet above the sea. Its *régime*, which is unusually steady and without sudden variations, demonstrates the part played in its hydrology by the permeable rocks which cover more than half its basin. A portion of the rainfall sinks into the limestone and chalk to reappear in springs. Just above London the mean annual volume at low water at Teddington in September

is 37 cubic yards per second, whilst in January at high water it is 169 cubic yards per second. This range marks the flow as regular. Floods are caused only by prolonged rain or by the sudden melting of snow (see Fig. 66). Owing to its steady character the Thames has for centuries had its fairway impeded by a large number of watermills, and the watermen were complaining of this hindrance to navigation as early as the 15th century. At the beginning of the 17th century the upper section was made navigable between Oxford and Lechlade and became a waterway for local traffic carrying cereals and freestone downstream and coal from London to Oxford.

The Thames was formerly joined to the Severn by two canals. Of these the Thames and Severn Canal, 30 miles long, had forty-four locks and a tunnel, through the bottom of which much of the water escaped. It is now practically disused. The Kennet and Avon Canal is 86 miles long, has 106 locks, and when in working order could carry loads of from 25 to 60 tons. Both canals are disused and uncared for, overgrown with weeds, and blocked by vegetation and overhanging foliage.

The Thames itself flows through meadows, but as it approaches London its clear stream runs past lawns and under the shadow of large trees. At Teddington Lock, where it begins to be tidal, it is suddenly transformed into London River. The gentle country stream becomes a huge estuary which is filled at high tide with an enormous volume of water.

CHAPTER XI

THE SOUTH OF ENGLAND

TOPOGRAPHICAL features different from those of the English Plain appear on the map between the Thames and the English Channel. The grain of the relief runs east-and-west with the Thames valley, and a compact area of high ground projects eastwards towards the French coast. Continental affinities are found in the rocks of which the region is composed, and on either side of the Straits of Dover white chalk cliffs face each other. Traces of a more southerly position are apparent, for the region is outside the area formerly covered by ice, the surface is without the uniform mantle of drift, and differences in the rocks are reflected in the sharply defined topography. There is more sunshine in these southern districts, and distant views are less veiled in mist. Whilst the Thames estuary enters the North Sea and East Anglia as a whole looks out towards the Netherlands and the Germanic peoples, this region faces the Latin races and has been the gateway of Roman invasion, the connecting link with Normandy during the Middle Ages, the scene of rivalry with France in later times, and the most frequented route to the Continent.

1. RELIEF

The structure controls the trend of the relief. The Anglo-Parisian chalk basin was upfolded towards the middle of the Tertiary into a huge east-to-west anticline which rose more than 1000 feet above the sea and was continuous from the Weald to the Boulonnais district in France (see Fig. 68). In the north the chalk dips down steeply under the Tertiary clays and sands of the London Basin. In the south it disappears in the same way under the sands and clays of the Hampshire Basin. Farther south still it is again upfolded in a narrower anticline which forms the Isle of Wight and the 'Isle' of Purbeck. This is apparently an extension of the Bray axis in France. The upfolding is so abrupt that the chalk strata are vertical along Alum and Whitecliff Bays in the Isle of Wight.

These structural features are reflected in the relief system, which comprises four almost parallel belts, two being the depressions of the London and Hampshire Basins, and two the high ground forming the backbone of the Isle of Wight and the long plateaus of the North and

South Downs. The low-lying Hampshire Basin is partly drowned by the Solent, whose narrow channel separates the Isle of Wight from the mainland. It forms a plain into which penetrate Southampton Water and the inlets near Portsmouth. The upland belt contains the Weald, which is the most curious element in the topography of southern Britain and the classic example of the relation between structure and relief.

When the chalk was upfolded into a huge anticline, the strata underlying it were upfolded with it. The removal of the upper part of the anticline by erosion has exposed, as it were, a horizontal section of the strata of the upfold. The outcrops run in concentric rings with the oldest beds in the middle. The chalk layers, which are 1000 feet thick, are on the outside, and within them appear one after another the whole series of Infra-cretaceous beds, consisting of

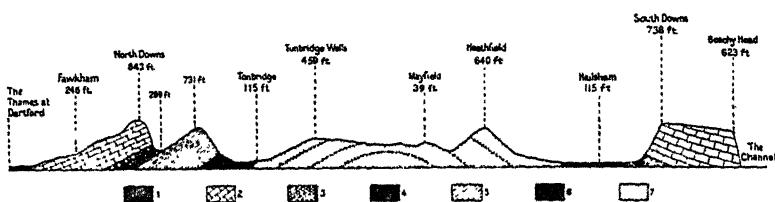


FIG. 67. Section through the Weald from the Thames at Dartford to Beachy Head.

- | | |
|---------------------|---------------------|
| 1. Tertiary beds. | 5. Lower greensand. |
| 2. Chalk. | 6. Wealden clay. |
| 3. Upper greensand. | 7. Hastings sands. |
| 4. Gault clay. | |

sand and greensand, 80 to 100 feet thick ; Gault clay, 120 to 330 feet thick ; other sands and greensand 660 feet thick ; Wealden clay 800 feet thick ; and Hastings sands 1000 feet thick. At the edge of the Infra-cretaceous the chalk rises in a line of inward-facing escarpments known as the North and South Downs. Inside the ring thus formed the less resistant beds of sand and clay have been denuded into the relatively lower, broken surface of the Weald (see Fig. 67).

Each type of rock which appears in the Weald has left its peculiar mark on the topography. The upper greensand forms wooded ridges known as 'hangers' ; the Gault clay causes a fertile depression which reaches the sea near Folkestone ; the lower greensand gives rise to the wooded heights south of Lenham, Maidstone, Sevenoaks, and Godalming ; the Wealden clay forms a ring of ill-drained, almost flat plains which end on the Channel coast in the Romney and Pevensey Marshes ; whilst the Hastings sands cause a very irregular surface with many heaths and woods, of which

Ashdown and St. Leonard's Forests are the most extensive. The varied relief marks the outcrops which appear one after the other along the Wealden upfold. The whole of this structural arrangement is exposed to view in a kind of cross-section formed by the cliffs overlooking the Channel from Beachy Head to the South Foreland. It comes to an end in the west as soon as the erosional gash in the anticline closes up, and the plateau surface is then formed of chalk only.

The other chalk anticline, which is narrower and runs parallel

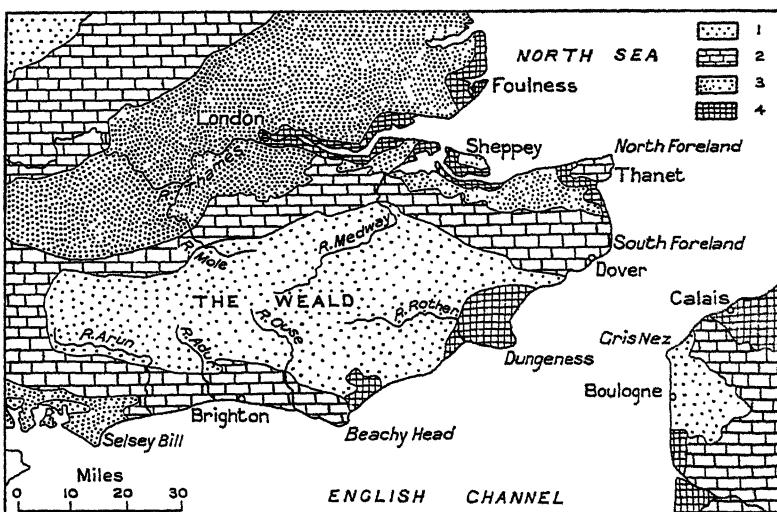


FIG. 68. Generalised Geological Sketch-map of the Weald and the London Basin.

- 1. Infra-cretaceous and Jurassic beds. 3. Tertiary beds.
- 2. Cretaceous (chalk) beds. 4. Quaternary alluvial deposits.

with the Weald on the far side of the Solent, shows the same structural influence in the pattern of its relief. It forms the chalk hills of the diamond-shaped Isle of Wight, and, beyond a gap now drowned by the sea, rises again farther west in the hills of the Isle of Purbeck.

2. THE CHALK DISTRICTS

The wide stretches of bare and sparsely populated country which mark the chalk outcrops from Wiltshire in the west to Kent in the east form a characteristic feature of the scenery of the South of England. It consists of raised undulating plains and long ranges of massive scarped hills. This bare, scantily peopled Down country

is still almost free from the network of fences and hedges which covers the other plains in Britain and cuts them up into fields. On Salisbury Plain the view is seldom obstructed and, but for the farmhouses concealed in folds of the ground and amidst fields of corn and fodder crops, there would be no sign of life. White roads run up and down the gentle undulations as far as eye can see. The more elevated areas are dry, and their grassy ridges afford grazing for sheep and form open country suitable for the evolutions of cavalry. Consequently, in them are to be found racing stables and military training areas, and one of the largest military camps in Britain has been established there.

The peace and quiet of the Sussex Downs is unequalled elsewhere. A short, thick grass grows on the gently undulating surface. In spring it forms a sea of green, in summer a thick springy carpet. Amid the close-set grass roots grow large numbers of wild flowers, including campanulas, scabious, cinquefoil, milkwort, thyme, and orchis. Here and there rise juniper bushes, gorse, and heather. On the top of the Downs the air is cool and fresh, and the force of the wind keeps the vegetation down to ground level, making it grow in cushion-shaped bunches. The views are magnificent. Towards the south appears the open sea ; northwards there is the great Wealden depression in which the outlines of objects are softened by a slight mist. The loneliness is relieved now and then by rustic scenes, as when shepherds take their flocks from the farms below to graze the tasty grass on the Downs. But there is life and activity in the charming valleys which run through the Downs or lie at their feet, and thus the contrast between plateau and valley, which is so noticeable in all chalk districts, appears here too. In the valleys the water which has filtered through the chalk gushes out in clear springs amidst loosestrife, willow-herb, buttercups, and watercress ; and with the appearance of the water in the valleys occurs a luxuriant vegetation of leafy elms and plane trees, avenues of superb beeches, of elders, thorns, sloes, and maples which are festooned with clematis and bryony and covered with flowering eglantine. Amidst this vegetation stand the old village churches surrounded by cottages with thatched roofs and flint-faced walls. The vegetation which flourishes in the warm soil on the slopes of these sheltered valleys bears witness to the sunny character of the climate. Walnut trees shelter the farms, and fig trees, laurels, and vines grow near the houses. The fissured, permeable nature of the chalk makes water scarce on the Downs and sometimes renders the water supply a difficult problem. Water for the stock is collected in dew ponds, the bottoms of which are lined with clay, straw, and stones. For household use deep wells are sunk and fitted with a

PLATE XLVII



[Photo: M. N. R. Jackson.

A. A SUSSEX LANDSCAPE NEAR BURY
The South Downs are seen in the back-
ground.



[Photo: M. N. R. Jackson.

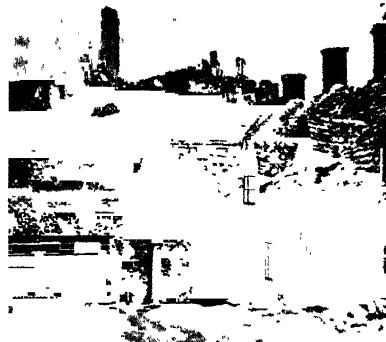
B. THE CHURCH AND RECTORY AT
WAREHAM, DORSET



[Photo. M. N. R. Jackson.

C. CORFE, DORSET

View from the north, showing the
limestone plateau of the Isle of
Purbeck behind.



[Crown Copyright.

D. OLD COTTAGES AT CORFE

[To face page 294.

PLATE XLVIII



[Photo, Bex. Brothling.]

A THE KINGSTON HILLS IN THE SOUTH DOWNS
Note the bare treeless character of the Downs. The coombe on the right in the middle ground shelters a farm.



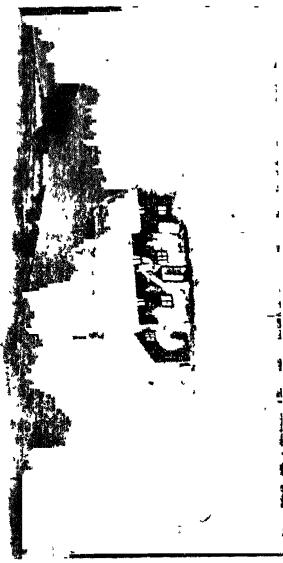
[Photo, A. Demangeon.]

B A HOP GARDEN IN SUSSEX
The view was taken at Bear's Head, near Fridge, and shows the hops in full foliage.



[Photo, The Times.]

C A FARM AND ORCHARD AT HARTFIELD, SUSSEX



[Photo, A. Demangeon.]

D A COTTAGE SET IN A COUNTRY LANDSCAPE NEAR DORCHESTER

pump worked by little windmills. When the wells reach the water-table, the supply held by the chalk seems inexhaustible. Borings in this rock furnish the water supply of Bournemouth and even a portion of that of the London conurbation.

Whilst the chalk downs are almost bare of habitation, the valleys are crowded with houses. Though the Sussex Downs contain something like two persons to the square mile, the Rother valley has 207 and the coastal plain 415 persons to the square mile. With rare exceptions, there are no villages above the 230-foot contour. They all nestle in the combes and little valleys in the chalk behind a curtain of tall trees. On Salisbury Plain they are crowded together along the valley bottoms, and in Hampshire some of the churches are built near springs (see Plate XLVII).

Owing to the nature of the country two features of long standing persist in the chalk districts : the practice of sheep-rearing and the existence of large farms. The soil is light, shallow, poor, and arid ; and a large acreage is needed to enable a farm to pay its way. Areas of silty land in the valley bottoms and on the lower slopes, as well as strips of water-meadow, must be included with downland in the farms, which are therefore large and often stretch from the tops of the downs right into the valleys. Such 'hill farms' are very common in Sussex and are in strong contrast with the little farms on the Weald. In Hampshire their average size reaches about 500 acres. A typical farm on the Wiltshire Downs contains between 500 and 750 acres, but there are some with 1000, 1500, or even 2000 acres. In south Wiltshire there is one property which is so big that the owner has cut it up into seven farms of between 500 and 1700 acres each. On these farms some of the fields contain as much as 80 or 100 acres. At one time they each had their own lime-kilns for improving the soil, which was composed of clay-with-flints. Today farm machinery is used on them. But, as they produce mainly corn and wool, they have all suffered greatly from slumps in agriculture caused by the competition of new countries.

In the chalk districts every farm has its flock of sheep, which is pastured on the downs. The animals are not allowed to scatter over the heaths as they are in the Welsh mountains and on the Pennine moors ; nor are they enclosed in grassy paddocks as they are on the fertile Midland plains ; but, as in times past, they still range over the downs in charge of shepherds and their dogs. At one time they all belonged to the famous breed of the Hampshire Downs, but for some time past the farmers have been breeding Black-faced sheep from the Scottish moors, since these are quieter and hardier. In Wiltshire some of the flocks contain as many as a thousand ewes. The importance of sheep explains the large part

played by sainfoin in modern crop rotation as well as the presence near the farms of huge pens and immense wooden sheds which are characteristic features of every country dwelling.

Grain and fodder are grown on the best farm lands. The four-year rotation comprises two crops of grain, one of wheat and the other of barley, and two fodder crops. On a typical farm in Wiltshire, out of 800 acres 450 are under the plough, 225 under downland pasture, and 50 consist of irrigated meadow. But the arable is being increasingly used for sainfoin, clover, mangold wurzels, peas, turnips, and ryegrass ; for to the sheep, which are still the form of wealth characteristic of the chalk districts, must be added an increasing number of cattle. The influence of urban centres has increased the raising of Shorthorn milch cows and the fattening of pigs. But though farming is changing its objectives, the districts keep their essentially rural character. There is none of the feverish activity of the large towns or the bustle of a large village population. Few parts of the countryside of Britain have witnessed such a great exodus of labourers, and migration townwards has depopulated the farms. An atmosphere of loneliness reigns over these wide plains, and the absence of fences and hedges from the scenery increases still more the feeling of complete peace and quiet sameness which pervades the whole chalk country.

3. THE WEALD

In contrast with the bare, even surfaces of the chalk districts, the Weald itself is hilly and contains an alternation of damp-bottomed dells and wooded heights. The very name still conjures up a picture of woodland. The district extends 100 miles from east to west and has a breadth of 50 miles from north to south. Set off in a frame of chalk escarpments, the Weald, with its strips of heath and woodland mingled with fields, pasture, and orchards, has the appearance of a once refractory district ; and, indeed, it was long included among what are usually termed regions of difficulty.

The sandstone or sandy heights of the Weald, which stretch from Horsham to Hastings and rise to an elevation of 874 feet in Crowborough Beacon, are still covered with heath and woodland. Clumps of oaks and beeches persist here and there, but as a rule the plant associations betray the poverty of the sandy soil. Pine and birch woods and chestnut copses alternate with open spaces covered with heather, bracken, gorse, and juniper. Sometimes reed-fringed ponds lie undisturbed in damp hollows. Much of this belt of country, which is a remnant of a once denser and more continuous forest, is waste and unsuitable for cultivation, and is occupied by parks,

commons, and rabbit warrens. Farming has scarcely gained a footing in it so far ; but it is no longer empty, since summer holiday resorts are being rapidly built at Mayfield, Heathfield, Balcombe, Crowborough, and, in fact, throughout the district. Yet, in spite of all the changes, traces of natural wildness still remain.

In Roman times the Weald formed a great forest known as *Anderida Silva*. Later the Old English called it *Andredesweald*. In prehistoric times settlement shunned it, and, whilst Neolithic remains occur frequently on the South Downs from Eastbourne to Portsmouth, they are almost wholly absent from the forest. The ancient Pilgrims' Way avoided the Weald and followed the North Downs to Canterbury. The forest belt was used as a frontier between human communities and the boundaries of Kent, Surrey, and Sussex still meet in it. For centuries natural obstacles hindered communication through it. Arthur Young wrote in 1771 that in a village near Lewes he saw a lady of quality going to church in a carriage drawn by six oxen, the roads being impassable to horses.

Iron was long the main source of wealth for the forest dweller. The ore was found in the form of nodules and of thin beds in the Infra-cretaceous Wadhurst clay in East Sussex and West Kent. The abundance of wood permitted large quantities of iron to be produced and the district became the main centre of metal-working in England. In the 14th century it supplied the army with enormous quantities of nails and horseshoes, and in the 15th and 16th centuries it produced cannon. In the 17th century the forest swarmed with iron works, which were placed near the streams so that the forge hammers might be worked by water power. The exhaustion of the forest and the competition of coke in smelting brought about a gradual decay during the 18th century, and since 1830 silence has reigned in the copses. The only traces of the former industry are found in place-names occurring here and there on the map : the Forge, the Furnace, Cinder Hill, and Hammerpond. With the iron works disappeared also the glass works at Wisborough Green in Sussex and Chiddingfold in Surrey, which died out for want of fuel. But there is a possibility of the revival of iron-working in the now rural countryside, for borings carried out in 1890 confirmed the existence of coal in Kent, and mines at Snowdon, Tilmanstone, and Chislet are already producing more than 300,000 tons a year. Iron has also been found interspersed between the coal beds, and iron works have already been established in the neighbourhood of Canterbury. The development of another 'black country' threatens to disturb the quiet scenery of England's green and pleasant land.

Owing to the large areas of woodland, to the poverty of the soil,

and to the existence of damp valley bottoms, farming has been trending towards pasturage for a century. Certain areas are admirably suited to raising livestock ; for example, the low-lying ground reclaimed from the sea and known as the Pevensey Levels and Romney Marsh. Within the chequer-work of canals and ditches, which are suggestive of Holland, vast herds of cattle and flocks of sheep are grazed on luxuriant grass. At one time the wealthy stock farmers were called 'the Romney Kings.' Although fortunes are not made so quickly now, yet stock-raising is as vigorous as ever. Romney yearling lambs, which spend the summer on the Marsh and in winter are moved to the tops of the Downs, are famous for their tasty mutton. Even in the areas formerly under the plough the Wealden farms are all tending towards the almost exclusive production of milk and meat, and permanent grass covers nearly half of Sussex and Kent. Green crops, turnips, beet, and cabbages occupy a greater area than corn crops on the plough land. Throughout the district fields enclosed by hedges in which grow oak, elm, and ash yield pasture to Shorthorn and Jersey cattle. The number of dairy farms has increased, and every little railway station is piled up with large milk cans destined for London, Brighton, Hastings, Eastbourne, and Seaford. The Downs still remain the true sheep area, and the rearing of the animals is still the basis of farming, especially on the South Downs. For their benefit crops of barley, rye, and artificial fodder are cultivated, and extensive pasture lands of fine, light, fragrant, and crisp grass are maintained on the chalk hills, which have been the home of sheep from time immemorial. The little town of Lewes, whose neighbouring countryside is the original home of the South Down breed, is still the great sheep market of the region. Sometimes the mediocre quality of the soil makes every effort at intensive stock-raising precarious. The farmers then take advantage of the proximity of the towns to concentrate on the raising of poultry. At Heathfield and Uckfield in Sussex extensive areas of grass are reserved for poultry, and thousands of birds may be seen pecking, scratching, and fighting. The poultry farms sell their birds to fatteners who regularly travel in carts through the countryside. The fatteners put the birds into runs and feed, cram, and fatten them to a nicety. Then the birds are sent to London, where they are known to *gourmets* as 'Surrey fowls.'

Fruit trees form a very characteristic feature in the scenery as well as in the economic life of the eastern portion of the Weald, for the district is favourable to fruit growing. Curtains of forest trees give the fruit trees shelter from the wind. Frequent differences in relief cause much variety of aspect, the greater sunshine favours the

ripening of the fruit, and the friable soil, found particularly on the northern slopes of the North Downs, is easily penetrated by tree roots. Kent has, therefore, been called 'the Garden of England,' and it deserved the name even at the end of the 16th century, when Camden wrote of it in his *Britannia*: 'Pomis ad miraculum abundans, nec non cerasis.' In this county apple, pear, cherry, and plum trees form immense plantations, usually on the higher ground where frost is avoided. Fruit trees are also planted in the pastures. Between the lines of trees in the orchards there are rows of raspberry and gooseberry bushes, and sometimes strawberries are cultivated between these. Trees like the hazel-nut, which are left to grow wild in France, are properly cultivated here and, instead of forming overgrown thickets, are kept free from undergrowth. In this part of Kent and Sussex there is scarcely a farm without its orchard. Competition for land is stirred up by proximity to the London market. Horsham specialises in tree nurseries, whilst in other places attention is concentrated on the growing of flowers, roses, and orchids. Gardening becomes more and more intensive towards the north on the friable soils which cover the slopes of the North Downs as far as the banks of the Thames, until, finally, the fields themselves are used for the cultivation of kitchen vegetables. The available space is shared by smallholdings, whose thousand and one dainty and highly priced products find a ready sale in the London market. Flowers and vegetables are grown in the neighbourhood of Canterbury, radishes in the Isle of Thanet, spinach and cress at Gravesend, vegetables in the Cray valley, medicinal plants at Mitcham, and cabbages and rhubarb at Mortlake.

The most representative of all Kentish produce, however, is hops. Whilst the crop occupies 4572 acres in East Sussex, 840 in West Surrey, and 1977 in Hampshire, it covers 30,394 acres in Kent, which is half the total area devoted to the crop in the whole of England. One of the special hop-growing districts is situated around Maidstone in the Medway valley, and another lies on the silty soils which fringe the North Downs from Rochester to Sandwich. Although threatened by the competition of American-grown hops, the crop has not lost ground in Kent. At one time the hop-fields bristled with a forest of straight rods up which the hop stalks climbed. But nowadays tall poles of chestnut or larch dipped in creosote are erected, and cord or galvanised iron wire is stretched from one to the other so as to hold up the stalks. When a hopfield is in full leaf it looks like a vast building made of green branches and topped with a dome of foliage (see Plate XLVIIIB); and sometimes a closely set line of poplars is planted to act as a wind brake.

The harvest requires a great deal of labour. This is supplied by

some of the poorer folk from the less wealthy parts of London, who move out to Kent towards the end of August and stay while the work lasts. Once picked, the hops are taken to drying ovens, or *oasts*, whose strange shape attracts the curiosity of people passing through the district. They are round towers of brick, 13 to 15 feet high, and are topped with a cone above which stands a cowled chimney. Inside the building the hops are piled on a wire netting which allows them to be reached by the warm air rising from a fire made of coal, coke, or charcoal. The dried hops are sent off to the breweries. In spite of the expense and risks to which the cultivation is exposed, hops still form a real source of wealth in the district.

The whole of the intensive horticulture in the region is done on smallholdings, and the smallholder, who works with his family, is the mainspring of cultivation almost throughout the region. In Kent many of the holdings do not exceed 10 or 15 acres in extent.

4. TOWN LIFE

The growth of urban communities in the midst of this agricultural region was due to influences which were not native, but came from across the sea. The peninsula of Kent runs out towards the Continent and from the earliest times has acted as a stepping-stone between Europe and Britain. Farther west, Southampton Water opens a way right into the Midlands. Thus, on either side of the Wealden barrier routes from over the sea lead into the heart of the island. One goes from Dover to London and on to the North. The other passes from the Solent to the Midlands and the Severn estuary. The first germs of town life grew up along these great highways.

The actual point at which the more easterly of these routes reached the island has varied in the course of history from Richborough to Deal, Dover, Folkestone, and Hythe. The highway leading to the Thames-crossing at London passed the Stour at Canterbury and the Medway at Rochester. Hence, both these towns owed their existence to the route. The Romans established the large military station of Durovernum on the present site of Canterbury, which had previously been occupied by a British village. The Jutes settled in the place, giving it the name of Cantwarabyrig (= the town of the men of Kent). The town lay on the route of the Christian missionaries from the Continent, and St. Augustine, who landed in 597 and shortly afterwards became archbishop of the whole of England, made it his headquarters. Since that time the history of Canterbury has been closely bound up with that of the Church in England. It is still nominally the

ecclesiastical capital of the country and contains a beautiful cathedral which was built during the 11th-15th centuries on the ruins of a pagan temple and of an early Christian church. It is a quiet little town of 24,000 inhabitants and has scarcely been touched by modern life, the bustle of which dies away at its gates. Rochester (pop. 31,000), which is situated on the Medway crossing, marks another stage on the way to London. It was originally the British village of Doubris and afterwards the Roman Durobrivæ. Since the 7th century it has been the see of a bishop, and its 17th-century cathedral occupies the site of a chapel founded by St. Augustine.

To the west of the Weald ancient towns occur at intervals along the routes leading inland from the Solent. Winchester (pop. 23,000), which is situated on the right bank of the Itchen, was in turn the British stronghold of Cær Gwent, the Roman Venta Belgarum, and the capital of Wessex. It was the residence of Alfred the Great and Knut, and it rivalled London until the latter's development as a seaport. Today it is a cathedral town and contains ancient buildings, old-world houses, archways, and narrow lanes. Salisbury (pop. 26,000), the county town of Wiltshire, stands at the confluence of the Avon, Wylye, and Bourne. It was formerly situated a mile and a half away at Old Sarum on a hill overlooking the present site. This former site had been occupied in turn by a British camp, a Roman fort, a Saxon town, and a medieval city. In 1220, the town was transferred to Salisbury, where the present cathedral was built in the 13th century. Around the cathedral sprang up the houses of the quiet city. As water suitable for washing wool was available, woollen manufactures were established, and at the end of the 14th century Salisbury ranked eighth among the towns in the kingdom. Not far away another Roman station built on an old British camp has been discovered near Amesbury.

None of the towns on the Weald is of the type which originally stood on ancient routeways, for the Forest diverted traffic from itself. The towns in the district are scarcely more than huge villages which have grown in size and wealth through local trade. They are nearly all situated at the entrance to a water gap through the Downs ; e.g., Ashford (pop. 15,000) on the Stour, where the Southern Railway has some repair shops ; Maidstone (pop. 42,000) on the Medway, which is the county town of Kent and contains breweries, paper mills, and agricultural nurseries ; Sevenoaks on the Darent ; Dorking on the Mole ; Guildford (pop. 31,000) on the Wey, the county town of Surrey, which was a fortified town in the time of William the Conqueror, a cloth-making centre in the Middle Ages, and is today a grain market ; Arundel on the Arun.

Lewes (pop. 10,800) contains an ancient castle which once guarded the gap through which the Ouse flows. The picturesque little town with its hilly streets and its old timbered houses is the county town of East Sussex. To these ancient towns must be added Tunbridge Wells (pop. 35,000), which owed its original growth in the 17th century to its mineral springs and its present expansion to its character as a country resort. It is now one of the summer holiday resorts of the London conurbation and stands in a district of health and woodland. Crawley has been selected as a site for one of the new towns planned to relieve the congestion of London.

The sea has been the main factor in the development of towns in the region. Every harbour along this coast has a town which in time of peace trades with the Continent and in time of war acts as a defence against invasion. In the 13th century the Cinque Ports (Hastings, Sandwich, Romney, Hythe, and Dover, to which were added later Rye and Winchelsea) were granted special privileges in return for their acceptance of the duty of undertaking the naval defence of the country. In 1277 they furnished Edward I with a fleet to fight the French and in 1293 defended the shores against an attack from Normandy. The names of these little towns are closely associated with the history of the age-long wars with France, with piratical raids, and smuggling enterprises. But with the exception of Dover they have long since ended their maritime career. Today rapid communication with the Continent is based on three ports, whose harbours have been equipped by the Southern Railway. Fast steamers make the crossing between Newhaven and Dieppe in four hours, between Folkestone and Boulogne in two, between Dover and Calais in an hour and a half, and between Dover and Ostend in four. A stream of passengers crosses every day in both directions, and the routes are also used for the transport of costly or perishable goods. Among them butter, eggs, poultry, fish, and fruit, as well as manufactured goods of small bulk and high value, e.g., cloth, glass, watches, and French motor cars, are imported from the Continent.

Dover has grown into a town of 41,000 inhabitants. As it has no natural harbour, two wet docks and a tidal basin have had to be constructed in modern times. To take full advantage of the commanding position in relation to the Straits of Dover the Admiralty has recently built two enormous breakwaters, thus making a storm-proof harbour for use as a naval base and as a port of call for liners plying regularly to New York and the Far East.

The Channel coast has had to be protected against the French, the traditional rivals of the English for the mastery of the seas. Whilst Dover watches Calais, Portsmouth forms a general weapon of defence and is an arsenal as well as a shipyard. It is built on

reclaimed land at the entrance of a long inlet which acts as an anchorage and is reached only through the Solent, which is sheltered seawards by the Isle of Wight. The anchorage can only be entered through a narrow passage. A chalk ridge behind the town commands the shore and is occupied by the fortifications of the land defences. Portsmouth depends for its existence almost entirely on its naval functions. For the equipment and maintenance of the formidable naval force stationed there it contains an arsenal, docks, shipyards, workshops, warehouses for provisions and other supplies, and factories for making pulleys, rope, sails, flags, biscuits, etc. The town has been formed by the fusion of four towns, viz., Portsea, Landport, Southsea, and Portsmouth itself; the whole containing a population of 249,000. With it must be mentioned Gosport (pop. 38,000) on the western shore of the narrow harbour-mouth. In this place are situated the naval hospital and the storehouses for provisions and clothing. Southsea is a residential town and a pleasure resort.

Southampton (pop. 176,000), another large seaport, has grown up at the inner end of Southampton Water, a long inlet opening out of the same sheltered waters. It owes its importance as a seaport to the occurrence of triple tides which lengthen the duration of the slack water at the flood. From very ancient times this wide inlet opened the way into the heart of England, but the modern expansion of the town dates from the middle of the 19th century. The reason for the recent development is that Southampton offers to passengers coming from or going overseas the advantage of the shortest overland route to London. Besides, the small range of the tide makes locks unnecessary, the only wet dock being the Inner Dock. Giant transatlantic liners which are too big to sail up the Thames to London use Southampton as their port of departure or as a port of call; in fact, as an outport of London, in order to avoid the dangerous navigation of the Channel. The railways, which in England were so intimately associated with shipping, hastened the development. The Southern Railway,¹ which had owned the docks since 1892, improved and equipped them so as to enable the largest vessels to enter them by day or night. In 1907 the White Star Line transferred from Liverpool to Southampton the headquarters of several of its regular services to New York, and, on its amalgamation in 1934 with the Cunard Line, made Southampton the terminus for the great Cunard-White Star liners. Other companies embark passengers at Southampton for New York, the West Indies, and South Africa. Before the war of 1914-18

¹ The railways south of the Thames were amalgamated to form the Southern Railway, which now forms part of the nationalised British Railways system.

several of the North German Lloyd and Hamburg-Amerika services used to call at the port. In 1920, the tonnage of shipping which entered Southampton amounted to 3,870,000. This figure placed it fourth among British ports in respect of overseas trade.

During the war of 1914-18 Southampton was the chief port of embarkation for France, and through it passed 8,000,000 men. Since 1920 it has been the terminus of the Cunard and the Canadian Pacific Lines, and more recently it has been used as a port of call by the Compagnie Générale Transatlantique. Between 1927 and 1936, to enable Southampton to meet the competition of Liverpool and Plymouth, the Southern Railway undertook great harbour works intended to take full advantage of the matchless conditions enjoyed by the port and to fit it out with a vast equipment. In 1933 was opened the King George V Graving Dock, the largest dry dock in the world. In 1936 the tonnage entering the port rose to 10,867,000 (excluding coastwise traffic), thus bringing the port up to third place in the United Kingdom. Moreover, it is the chief passenger port, for through it pass annually more than 500,000 passengers. It trades mainly with North America and South Africa, but also with the Mediterranean, the Far East, and South America. In spite of the large quantity of petroleum imported from America and of the establishment of refineries, there is very little industrial development at Southampton. But, on the other hand, there is a large re-export trade, and the port is rivalling Liverpool for second place among British ports in respect of this. In 1936 the value of the goods re-exported from it to foreign countries amounted to £7,238,000.

Its prosperity is a reflection of that of London, from which nearly all its passenger traffic is derived. Furthermore, the cargoes of foodstuffs, including meat, butter, fruit, potatoes, bacon, and raw material like rubber, wool, cacao, and coffee, landed at Southampton are destined for the metropolis. Its exports consist not only of manufactured goods, cloth, and machinery, which are able to bear a slight increase in the cost of transport by rail from the industrial centres, but also goods which are re-exported from the London warehouses. Even its scientific institutions link it with the capital, for it is the headquarters of the Ordnance Survey of Great Britain. Thus, it is associated with London both in its commercial and geographical functions.

Southampton is not the only satellite of London which is situated on the South Coast. On the shores of the English Channel there exist some 50 or 60 miles from London a row of regular suburbs of the great city, a kind of English Riviera favoured with many hours of sunshine and with a warm, clear atmosphere. The towns along

this coast, including the ports, are all used, some in summer and others all the year round, as refuges from city life. Lining the coast so closely as sometimes to merge into each other, they form a belt frequented by smart, well-to-do crowds and provide a resort for those in search of recreation and pleasure. They are, as it were, a brilliantly lit avenue, a façade whose bright lights shine out into the night. Several of them are big towns, and they are all connected with the interior by a close network of railways. A boat sailing along the coast from Kent to Dorset passes, one after another, Margate (pop. 31,000), Broadstairs, Ramsgate (pop. 33,000), Deal, Dover, Folkestone (pop. 36,000), Hastings and St. Leonards (pop. 65,000), Bexhill, Eastbourne (pop. 57,000), Brighton (pop. 147,000), Shoreham, Worthing (pop. 46,000), Bognor Regis, and Southsea. Brighton, the most important of them and sometimes known as 'London-by-the-Sea,' is the pearl of English seaside resorts. Its smart season begins in November. The Isle of Wight as a whole belongs to this belt of residential areas and holiday resorts, owing to its delightful climate and the beauty of its cliffs and rural scenery. Its prosperity depends on holiday makers and visitors who bring money to Ryde, Sandown, Shanklin, Ventnor, Newport, and Cowes, the last of which is the world's most famous yachting centre. Since 1888 the island has been an administrative county. It has a population of 88,400, which gives a density of 585 persons to the square mile. To the west of the Isle of Wight the line of towns continues in Bournemouth (pop. 117,000), which is surrounded by pine woods, Poole, Swanage, Weymouth (pop. 22,000), Lyme Regis, Seaton, and Sidmouth.

This collection of seaside resorts represents a peculiar type of culture. Englishmen organise their pleasures and their holidays in the same business-like way as they manage their factories. The towns are focussed on their beaches and contain a crowd of hotels, restaurants, cinemas, bandstands, concert halls, skating rinks, and theatres. Every conceivable form of amusement and recreation is provided : piers, promenades, parks, race courses, yacht clubs, tennis courts, croquet lawns, and golf links. The towns are nearly all modern and are built on a regular plan with attractive architecture. In summer they are alive with colour and noise, but in winter they fall asleep. Yet some contain an increasing number of permanent residents, for the population of Sussex has grown during the 19th century from 160,000 to 770,000, one-half of the increase being attributed to Brighton, Hastings, and Eastbourne. The rapid growth of coast towns here is merely another episode in the development of London's vast conurbation.

CHAPTER XII

LONDON

LONDON is a colossal city with a vast population quite out of proportion to the modest basin and even to the country in which it is situated. Its enormous growth cannot be explained by local causes, but must be sought in factors derived from overseas. For centuries the city has been essentially commercial, and its overseas trade, which made it the largest port in England during the Middle Ages, has in modern times caused it to become the largest port in Europe and for two centuries caused it to be the greatest seaport in the world. Its commercial functions have also made it the political capital of Great Britain.

1. TRADE AND COMMERCE

The site on which London was destined to grow and develop assumed importance as soon as the Roman conquest brought the island within the commercial orbit of the ancient world. It was the nearest point at which the Thames estuary could conveniently be crossed by the great highway leading from the Continent. This route began on the Straits of Dover at *Dubris* and *Rutupiae* (Richborough) and passed through *Durovernum* (Canterbury), Crayford, Dartford, and Deptford. It forded the Thames at Westminster, where at low tide only a shallow film of water lay on the sandbanks. Later, when efforts were made to bridge the river, the crossing was removed two miles downstream to a point at which was fixed the port of the British tribal capital, now represented by the city of St. Albans. Probably London Bridge was built of wood in Roman times and was not constructed in stone until the 13th century. After crossing the Thames, the great highway, which was later known as Watling Street, continued northwards as far as Chester, whilst branches led to East Anglia, the Severn estuary, and the Solent. As early as the 1st century A.D. Tacitus described it as a busy commercial and trading centre : 'Londinium . . . copia negotiatorum et commeatum maxime celebre.' But it was as yet only a halting-place for traffic through the island and a meeting-place of persons travelling by chariot or on foot. Later, when it became a seaport at the head of the tidal estuary, its functions

widened. The city stands at the upper limit of sea navigation, which on the Thames is farther inland than in any other estuary in the country ; and its position increased in importance as the Germanic world took shape and form on the shores of the North Sea. Its emergence from the isolation in which the departure of the Romans had left it and the growth of its maritime activities were due to the influx of traders from the Germanic countries.

THE BEGINNINGS OF COMMERCE. London is first mentioned as a seaport in a charter of King Æthelbald in A.D. 734. At an early date merchants from Cologne, Lübeck, and Rostock, who were known as 'easterlings' or 'Emperor's men,' and who represented the interests of the Hansa, an association of German commercial towns, established a trading post in the town, setting up a famous warehouse on the spot now known as the Steelyard near the mouth of the Walbrook in the present ward of Dowgate. English foreign commerce in the Middle Ages and the contact of London with international currents were due to their agency. One of the first acts of William the Conqueror was to confirm the citizens in their rights and liberties, and the wealth of the London merchants made them powerful enough to secure a renewal of this charter of Corporation in the first year of the reign of Richard Coeur-de-Lion. The part played in politics by the city kept pace with its commercial expansion, and the Lord Mayor was among the signatories of Magna Carta.

London merchants chafed at the privileges enjoyed by the Hansa and wished to win freedom of action. Enriched by the wool trade, they founded the Company of Merchant Adventurers at the end of the 15th century and, using their great wealth, began to export wool and cloth on their own vessels, to trade independently with Antwerp, and gradually to diminish the influence of the German league. The last of the German traders left the kingdom at the end of the 16th century, and the English Crown embarked on a national policy whose essentials fostered London's interest. Soon after the Age of Discovery had opened up new horizons to trade, London threw itself into overseas ventures. The Muscovy Company was founded in 1553, the Baltic Company in 1579, the Levant Company in 1581, and the East India Company in 1600. The first English settlers to establish themselves on the coasts of the United States sailed from London. In a short time sugar, rice, indigo, coffee, silk, furs, cotton, gold, and other products of the new countries began to reach the London market. In its foreign trade the port absorbed in turn the commerce of the Hansa, of Antwerp, and of Amsterdam, and it soon began to assume gigantic importance in the country. Whilst in France towns like Lyon, Bordeaux, and Rouen held their

own with Paris, 18th-century London dominated all the other cities in England in the same way as in our own times Rio de Janeiro dominates Brazil, Buenos Aires the Argentine, and Melbourne and Sydney Australia.

THE COMMERCE OF LONDON. The *entrepôt* trade, which arises from London's world connexions, is the most peculiar feature of the commerce of the city. The banks of the Thames have become a vast warehouse in which the produce of every country in the world is collected and redistributed, and today the re-export trade is one of the main characteristics of London. Tea, formerly imported from China, now comes chiefly from India and Ceylon and is re-exported to the Continent and the United States. Nearly all the tea, half the rice, cocoa, meat, petrol, and paper, more than half the cane-sugar, and three-quarters of the rubber imported into the United Kingdom are landed in London. It should be noted, however, that Hamburg and Havre now import more coffee than London. Two-thirds of the wool imported into the United Kingdom and one-quarter of the total world production of wool passes through the city ; and though the Argentine sends most of its clip to Antwerp, Dunkirk, and Bremen, London is still the principal market for Empire wool, whether it is destined for use in the Yorkshire mills or for sale on the Continent. The city is also an *entrepôt* for other kinds of goods : grain from India and Russia ; skins from the Argentine ; hemp, rubber, uncut diamonds, ivory, gold, tin, and copper. The transactions and enterprises connected with the *entrepôt* trade have during the course of centuries caused a vast accumulation of wealth in the city.

The sphere of London's commercial activities extends from the neighbouring regions of Europe to the four corners of the earth and represents several centuries of effort, the history of which has merged into that of the expansion of the British Empire. The leading position in the trade with Scandinavia and Russia, won during the Middle Ages, is still held conjointly with Newcastle and Hull, and cereals and timber are imported from those countries. On the other hand, grain from America passes through Liverpool. Whilst the latter carries on a flourishing trade with Canada, West Africa, the United States, and South America, London shares with Bristol the leading place in the trade with the West Indies and Central America, which it inherited from its early enterprises in the tropics. The whole of the eastern hemisphere, including the countries of Asia, Australia, New Zealand, and the Pacific Islands, to which the conquest of India led the English, falls within the sphere of London's commercial activities. India, South Africa, the Far East, Singapore, Hongkong, Shanghai, Australia, and New Zealand are favourite

PLATE XLIX



[Photo: *Aerafilms*.]

A. TOWN-PLANNING IN LONDON'S OUTER RING

View of Greenhill, Harrow. The preservation of the trees and the existence of large areas of open space are features of modern English planning



[Photo: *The Times*.]

B. A STREET MARKET IN STEPNEY

[To face page 308.]

LONDON
View from the Monument looking towards Tower Bridge.

[Photo Valentine.



fields of operation for the London merchants, and the great shipping companies—the British India Steam Navigation Co., which was founded in 1845; the Peninsular and Oriental, founded in 1839; the Orient Pacific Line, and the Union-Castle Line—run regular services to them.¹

This commerce made London up to 1939 the world's chief money market. The city acted as a central bank, an intermediary for exchange throughout the world, a counter over which payments were made for all sorts of transactions, even when the goods in question did not pass through London. Merchants in every part of the world were sure to find in London the cash necessary to pay for goods they had delivered, and bills of exchange were sent thither to be cashed from every corner of the earth. Commission on these exchanges was received by the London banks and increased the vast store of capital at the disposal of the bankers. This store was used for financing colonial enterprises—banks, railways, shipping lines, mines, and telegraph cables—that tightened the bonds between London and the industry of the whole world. The immense amount of capital derived from commerce begot more commerce, and by means of it

¹ NET TONNAGE OF ALL VESSELS ARRIVING AT AND DEPARTING FROM LONDON AND LIVERPOOL IN 1936.

Country of origin or destination.	London.		Liverpool.	
	Arrived.	Departed.	Arrived.	Departed.
Irish Free State	188	190	1,010	1,091
Northern Europe (Foreign) . . .	6,536	8,475	1,363	1,465
Europe (Atlantic) and Western Mediterranean countries	1,741	1,676	661	541
Central and Eastern Mediterranean countries	942	401	407	313
West and South Africa	275	294	599	675
East Africa, Persian Gulf, India	2,124	1,415	1,051	1,569
Eastern Asia and islands in the Pacific.	1,735	809	410	532
Australasia	2,271	1,239	949	522
North America—Atlantic Coast	2,421	1,138	2,881	2,196
West Indies and Central America (Atlantic Coast)	1,346	675	643	536
South America—Atlantic Coast	1,069	890	922	618
South and Central America—Pacific Coast	99	65	265	220
North America—Pacific Coast	1,046	189	762	134
Other places outside United Kingdom — — — — —	—	—	35	—
TOTAL	21,793	17,456	11,958	10,412

N.B.—The table includes ships with cargo and in ballast and in some cases comprises more than one voyage by the same vessel.

costly produce from tropical lands or from new countries in need of capital could be bought and resold. London was perhaps the only place in the world to which any quantity of any kind of goods whatsoever could be consigned with the certainty of their being sold and paid for. This close connexion between finance and commerce explains the prosperity of London's *entrepôt* trade, especially during the 18th and 19th centuries. To-day the city has lost its monopoly, for the world has been undergoing changes which have undermined London's supremacy, and rivals are now contesting its leadership. Industrial countries are tending to establish direct connexion with the sellers of raw material and the purchasers of manufactured goods. This was demonstrated in practical form before the war of 1939 by the landing of rice at Amsterdam and Hamburg ; of cotton at Liverpool, Havre, and Bremen ; and of wool at Hamburg, Antwerp, and Dunkirk. The silk market deserted London after the opening of the Suez Canal ; the whole of the world's production of tea no longer passes through its warehouses, as the United States import large quantities directly. Brazilian coffee and Argentine wool are no longer distributed by way of the Thames.

But, in spite of all, the re-export trade remains one of the peculiar functions of the great port, through which pass one-half of the goods re-exported from the United Kingdom. Until recently the value of re-exports represented one-third of the total value of London's exports, amounting to £40,000,000 in 1882, £35,000,000 in 1899, £46,000,000 in 1906, and £91,600,000 in 1925. But the trade has suffered from the growth of industry on the Continent and from the increase of direct relations between European and extra-European countries. At the present day re-exports have dwindled to one-fourth of the total exports, and in 1936 they amounted to no more than £36,200,000.

The essential factor in the trade of the port today is the fact that London is the world's largest town. A vast stream of transport is required to supply its swarming population, and apart from articles like wool, metals, and tea, which feed the *entrepôt* trade, the chief place in the table of imports is held by goods destined for consumption in the town itself, viz. grain and flour, meat, butter, cheese, eggs, sugar, fruit, livestock, wine, tobacco, oil, and petroleum. The value of the imports rose from £124,000,000 in 1872 to £199,000,000 in 1906, £396,000,000 in 1915-19, £498,000,000 in 1925, but fell to £353,000,000 in 1936. The importance of the task of supplying the needs of an enormous population is shown by the amazing disparity between imports and exports. In 1913, the value of imports was two-and-a-half times, and in 1925 three times, that of the exports (£498,000,000 as against £160,000,000). The

disparity is still maintained, as witness the figures for 1936 : imports £353,000,000, exports £120,000,000. As London is not the centre of a great industrial district, it provides few goods for export, and many ships which discharge their cargoes there must seek return freight in Middlesbrough, Newcastle, Cardiff, or elsewhere.

The fact that London has grown into the world's largest town was up to the war of 1914-18 enough to make it the world's most important seaport. But some of this superiority has been lost, for other ports, both British and foreign, have been growing faster than, and sometimes at the expense of, London. In the middle of the 18th century its customs dues exceeded the sum total of dues paid in the rest of the country. In 1853, one-third of the tonnage entering British ports and one-sixth of that departing from them entered or departed from London. By 1900, owing to the competition of Liverpool, Hull, and Southampton, these figures had fallen to one-fourth and one-seventh respectively, and in 1936 the former had sunk to one-fifth. Foreign ports like Antwerp, Hamburg, and Rotterdam have been capturing part of its *entrepôt* trade, and their youthful vigour has caused them to expand at a rate which has to some extent upset the established prosperity of London. Between 1870 and 1905 the tonnage entering and departing from London increased by 3·2 per cent. every year, whilst that entering and departing from Antwerp and Rotterdam increased by 8·9 and 16·6 per cent. respectively.

Nevertheless, the trade of London continues to grow slowly. Between 1819 and 1859 it had increased by 192 per cent., and between 1859 and 1900 it had increased by 250 per cent. Including entries and departures, overseas and coastal trade, the shipping in the port rose to 33,000,000 tons in 1913, which made it the largest port in the world. This total has increased and in 1936 it rose above 62,000,000 tons ; but it has been exceeded by that of New York. The world's largest port is therefore no longer on the banks of the Thames, but on those of the Hudson. In 1935 the tonnage of shipping entering New York amounted to 35,000,000 as against 29,674,000 in London, and the Japanese port of Kobe is following close on the latter's heels with 28,334,000 tons. But the shipping trade of London has not decayed, as the fact that its total tonnage has nearly doubled since 1913 clearly proves. In the course of its development the city has diverted some of its shipping to outports like Southampton, Dover, and Folkestone. The first of these deals with perishable goods and transatlantic passengers, whilst the other two are cross-Channel ports.

Within the United Kingdom London still maintains its position as the most important port in the country. The extent to which

this is true is shown by the fact that the value of the imports and exports in 1936 together amounted to £510,000,000, or 38 per cent. of the overseas trade of the United Kingdom, whilst the corresponding figure for other ports were : Liverpool £297,000,000 ; Hull £81,000,000 ; Southampton £64,000,000 ; Manchester £59,000,000 ; and Glasgow £50,000,000.

2. THE PORT OF LONDON

The Thames, which provides a harbour and opens the way to the sea and so to the ends of the earth, is the principal instrument of the commerce of London. When James I threatened to transfer the headquarters of government from London the Lord Mayor replied : 'But your Majesty cannot take the Thames from us.'

THE RIVER. The estuary, or that part of the Thames which is affected by the tide, begins at Teddington, where the last slight pulsations of ebb and flow are felt 20 miles upstream from London. But in practice the upper end of the estuary is marked by London Bridge, whilst the sandbank on which the Nore lightship is anchored is generally regarded as the lower end. Between the two extremes of the Nore and London Bridge runs a broad ribbon of water 55 miles long, which is known to sailors as 'London River' and which technically forms the Port of London.

The hydrography of this reach is dominated by the tide, not the river. The extent of this preponderance will be realised from the fact that the mean volume of river-water is one nine-hundred-and-fifty-thousandth part of the amount furnished by the tide, and that 96 per cent. of the water in the estuary merely runs in and out with the tide. Above London the Thames is a quiet stream whose course winds through meadows and gardens, where trim houses line the banks, and swans float on the limpid water. Here its volume is small and is affected by pronounced summer droughts. But below the city it is a vast body of water swollen twice a day by the rising tide. The funnel-shaped estuary causes a concentration of tidal energy, so that the range increases as the channel narrows and as the depth decreases. The mean difference between high and low water mark at spring tide is 16 feet 1 inch at the Nore, 18 feet 8½ inches at Gravesend, 20 feet 7 inches at the Royal Albert Docks, and 21 feet at London Bridge. This great range allows ships to sail far up into the estuary.

The tides also affect the bed of the river. Below the Nore sea conditions prevail and the wide bight which lies between the Naze and the North Foreland resembles the rest of the southern portion of the North Sea in containing sandbanks. But between the banks

PLATE LI



[Photo. Aeroflms.]

LONDON
The view shows the Houses of Parliament, Westminster Abbey, Westminster Bridge, and across the Thames the offices of the L.C.C.
[To face page 312.]

PLATE LII



[Photo: Aerofilms.]

THE WEST INDIA DOCKS, LONDON

Note how the docks stretch from meander to meander, and have double entrances.

are fairly deep permanent channels. Of these the principal is the Duke of Edinburgh Channel, which at low tide has an almost constant depth of 32 feet 9 inches. One feature which distinguishes the Thames from the Mersey is the absence of a bar across the channel. This has proved an enormous advantage by rendering unnecessary in the Thames the vast dredging operations which have had to be carried out off Liverpool. But sandbanks begin to obstruct the channel off the Nore between Shoeburyness and Sheerness, and this obstruction continues as far as Gravesend. Frequent variations in the strength and direction of the tidal streams cause continual changes in the position and shape of the banks and channels. In the Leigh Middle Sands, which run for nearly eight miles from Shoeburyness to Canvey Point, there are only two narrow channels of little depth. A vessel drawing 25 feet of water, with an allowance of two feet under the keel, would pass the Leigh Middle Shoals without delay at any state of the tide on about 125 days in each year, but might, if she arrived at an unfavourable state of the tide, be detained for want of water on the remaining 240 days. Those drawing 28 feet might have to wait every day in the year for periods varying from a moment to about 5½ hours. Hence dredging is necessary in these channels.

Between Gravesend and London Bridge is the last tidal reach, and here the fluvial character of the channel is more apparent. There are meanders with sharp corners where ships are liable to collision; the fairway is narrow, sinuous, and unstable; and, since the river bed is a drowned portion of the valley, the water gradually becomes shallower upstream. At low tide it has a depth of 49 feet at Gravesend, 19½ feet at Barking, and only 9 feet at London Bridge. There are records of tides so abnormally low that the Thames could be forded near London Bridge. Consequently, this reach of the Thames is navigable by large vessels, and even by those of moderate tonnage, at high tide only, and ships are forced to wait at Gravesend for the tide. Gravesend is in a sense the vestibule or 'watergate' of London, for ships anchor there to await the tide and to take pilots aboard. Owing to the difficulties of navigation in the fairway and to the shallowness of the water, vessels of a certain size which can enter Liverpool or Glasgow are unable to reach London. Thus, the traffic in the Port is controlled by the tides which raise the depth of the water; but they also cause great variations in depth, leave shallow passages between the sandbanks, and make the channels unstable.

Before the days of steamships the tide supplied the power which moved vessels up and down stream, and it regulated all movement of traffic in the river. About the year 1800, ships had at half-tide

a depth of 20 feet of water for more than three hours from one end of the tideway to the other. Undertakings like the demolition of the old Port of London at the beginning of the 19th century, the construction of embankments in the middle of the same century, and the recent dredging operations have deepened the fairway at high tide ; and today ships have 34 feet of water for five hours at any high tide throughout the year to enable them to reach the King George V Dock. This means that vessels up to 30,000 tons can normally enter this dock. The tidal stream is still taken advantage of by the traffic. A barge can cover between 8 and 14 miles in a single tide, which means that the central docks—the Royal Victoria and Albert and King George V Docks—are one tide distant from the Pool of London for boats which are not towed.

THE WORKING OF THE PORT. The most curious feature of the traffic in the Port of London is that it spreads out over an immense distance from the Pool to Gravesend. This expansion took place during the 19th century. Up to the beginning of that century the points at which vessels moored were near the City between the Bridge and the Tower. But the increase of traffic and particularly of the tonnage of ships has gradually pushed operations downstream towards the deeper water, so that now the outermost docks at Tilbury are 26 miles from London Bridge, and the docks and quays are spread out over this distance. Up to the beginning of the 19th century the work of loading and unloading vessels was carried on in the river itself opposite the business houses of the City, either alongside the wharfs and quays or else at anchor in the Pool. The drawbacks usual in ports with a high tidal range were felt, for ships were unable to moor alongside the wharfs and quays unless the tide was high. The loss of time involved increased with the volume of traffic. At times when there was a great deal of traffic every flood tide brought in a number of ships which were unable to make their way through the ships already at anchor, and vessels from India were sometimes forced to wait four or six weeks before being able to discharge their cargoes.

To ease this congestion of traffic on the river it was decided to construct docks which would afford more room and ensure a constant level of water, so that the work of loading and unloading could be carried out uninterruptedly and unaffected by changes of level due to the tide. Downstream from London Bridge the banks of the Thames lent themselves to the construction of docks owing to their lowness and to the loose character of the rock. Besides, the meanders of the Thames enclose wide tongues of land and thus allow docks built across these tongues to have an entrance at each end. The docks are therefore divided topographically into four

groups, one group to each meander (see Fig. 69). With the exception of the Surrey Commercial Docks, they are all on the left, or

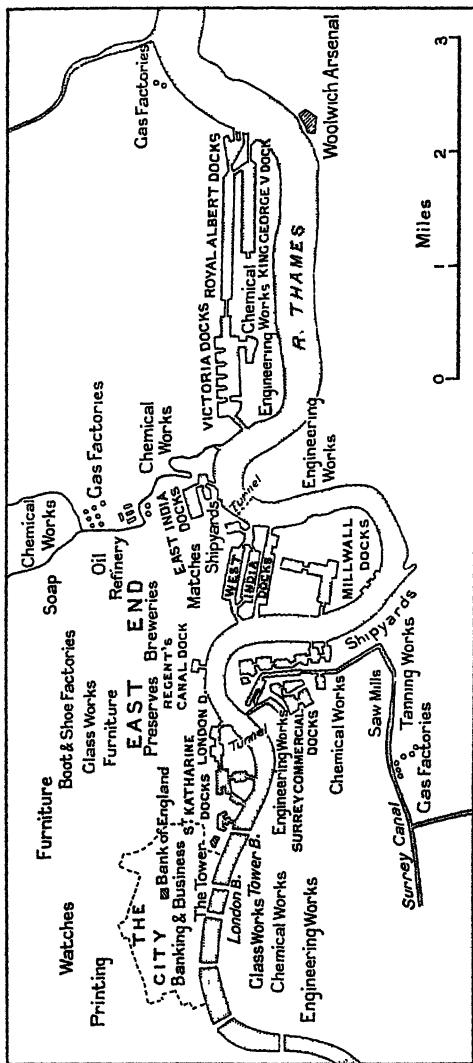


FIG. 69. The Port of London.

The Port of London stretches downstream from London Bridge, above which ocean-going vessels do not go. Ships are loaded or unloaded in the river itself or in the docks. Except the Surrey Commercial, the docks are all on the north bank. The low ground in the valley bottom has permitted them to be constructed between the ends of the meanders, thus ensuring two entrances. The docks near the City are mainly concerned with the *entrepôt* trade. The increasing size of modern ships has caused the Port to move downstream towards the deeper water. Consequently, the Tilbury Docks, 26 miles below the Pool, are not shown on the map.

north, bank, whence the railways reach the warehouses in London without crossing the river. In order of date of construction they are : the West India Docks, 1805 ; the London Dock, 1805 ; the

East India Docks, 1806; the Surrey Commercial Docks, 1815; St. Katharine Docks, 1828; Royal Victoria Docks, 1855; Millwall Docks, 1868; West India Docks enlarged, 1870; Royal Albert Docks, 1880; Tilbury Docks, 1890; and King George V Dock, 1921. In all they cover 712 acres of water surface and have 44 miles of wharfage. The traffic is thus divided now between the river near London Bridge and the series of docks running from the City to Tilbury. More than one-half is connected with the former. It should be noted that neither the river nor the docks are ever frozen over, so that London escapes the inconvenience of ice suffered by some ports on the Continent (see Fig. 69 and Plate LII).

In contrast with ports like Antwerp and Rotterdam, none of the docks or groups of docks is reserved for a particular type of work or for any particular kind of merchandise. Their use depends mainly on their size and navigational features, particularly on their depth, which ranges from 27 to 45 feet; and, with a very few exceptions, each of them handles every kind of cargo. Consequently, the traffic gives an impression of confusion and dispersion, in which the mind strives in vain to find some trace of order. Nevertheless, method does exist in the vast organisation, which is the result of age-long experience and of an ingenious adaptation of the dock-work to the navigational conditions. The docks are but detached members of the same body, and co-ordination is achieved by one of the most curious arrangements devised by the English mind, viz. the barge system. There are some 8000 of these craft, which vary in size from 20 to 100 tons and which link ship with ship, dock with quay, and quay with ship, carrying from the big ships, moored in the docks downstream, goods which are to be warehoused in the City or else to be transhipped to other vessels for re-export. They also collect merchandise from all parts of the Port and take it to the ships. The numerous flotilla of barges forms the internal traffic on the river and enables the work of the Port to be carried on. They belong to an old 16th-century corporation, the Watermen and Lightermen's Company, which holds a monopoly of these minor carriage operations. The Company shows a dislike for innovations, for the use of steam and motor barges has been introduced only gradually, and the boats still drift up and down with the flow and ebb, wasting precious hours in waiting for the proper moment to enter or leave the docks with the tide. But this peculiar method of transport cannot be abolished, for it is well adapted to the enormous length of the river banks, the scattered nature of the docks and quays, and the distance separating the upper from the lower docks. It has been calculated that 80 or 90 per cent. of the goods which

pass through the Port are carried to or from the ships in barges, and that the docks are entered by barges more than 215,000 times a year.

As far as any specialisation can be distinguished in the docks, Tilbury has a special landing-stage and railway facilities for passenger traffic and imports wheat, copra, and rice from India and butter and fruit from Australia ; the Royal Victoria and Albert and King George V Docks handle chiefly meat, tobacco, and grain ; the Surrey Commercial Docks receive softwood from America and northern Europe ; the West India Docks import rum, sugar, hardwood, plywood, fruit, and wood pulp ; the Millwall Docks are specially equipped for storing grain, but receive a variety of produce ; the East India Docks trade mainly with the Mediterranean ; and finally, the London and St. Katharine Docks are fitted with vast warehouses for storing wool and handle general cargo from Continental and coastwise ports.

Some of the features of the Port of London are due to its long-established character. Unlike its younger rivals on the Continent, it has not been able to keep abreast of modern progress. The fairway has been deepened so as to give a depth of 33 feet at low tide as far as the Royal Albert Dock, and several large docks have been constructed or enlarged. But no sooner have these improvements been effected than the Port has begun once more to fall behind in traffic requirements. Hence, it is now proposed to remodel the Royal Victoria Dock entirely and to build more quays and warehouses in other places.

The greatest improvement, however, has been the reorganisation of the administration. Before 1908 there were nine authorities whose control overlapped and caused a confusion, to the great detriment of the working of the Port ; but now the control is solely in the hands of the Port of London Authority, a committee of thirty members representing the Admiralty, the Ministry of Transport, the City, the London County Council, Trinity House, and the wharfingers and owners of river craft. This body ensures co-ordination and smooth working and regulates all the activities of the Port and its 15,000 or 20,000 employees. This unique form of administration is specially adapted to the great port, which is one of the most peculiar contrivances of maritime trade in existence. Unlike many other big ports, its operations are mainly connected with the sea, even its internal traffic moving by water, not by rail or road, and there is hardly any connexion with inland navigation. Thus, the Port depends almost wholly on the sea, which has been the all but exclusive source of its greatness.

3. POPULATION

The world-wide commerce of London has led to an enormous concentration of population in and around the city. Even in the 19th century, when many large towns grew up, London was unrivalled in size. In 1682 it contained a population of 670,000, whilst Bristol, then the second largest city in the kingdom, contained



FIG. 69A. Greater London.

The black area is the City. A thick line surrounds the County with its 28 metropolitan boroughs (see p. 328). The dotted lines mark the boundaries of the local government areas in which urban development is continuous with that of the County of London. These include the three County Boroughs of West Ham, East Ham, and Croydon ; 31 Municipal Boroughs ; and 16 Urban Districts. (Scale : 1 inch = 8½ miles.)

only 30,000 inhabitants, and writers were already anxiously expressing their opinion that the metropolis was a head that was too big for its body. When, during the 19th century, the joint populations of Glasgow, Manchester, and Liverpool, together with their respective suburbs, approached the million mark, London still kept the lead by a long way. Today it remains by far the largest town in the country and is an urban monster the like of which has never been seen.

Its population passed the million mark between 1800 and 1810 and rose to 2,800,000 in 1861, and 4,397,000 in 1931. This figure

includes the administrative county alone. But the administrative county merely represents London in 1899, and the expansion of the city since that date has increased the population two and a half times and the area seven times. An Outer Ring of formerly independent villages, among which are Dagenham, Ilford, Tottenham, Finchley, Hendon, Willesden, Wembley, Harrow, Acton, Ealing, Southall, on the north and west, and Richmond and Wimbledon on the south, has rapidly grown into a solid urban fringe by the expansion and fusion of its several components. In 1913 Hendon was a mere village, and Harrow contained 21,000 inhabitants. In 1938 the former had an estimated population of 165,000, the latter one of 195,000. This Belt now forms an integral part of London. Beyond the Outer Belt runs a line of fast expanding villages and towns, among which are Cheshunt, Rickmansworth, Uxbridge, Weybridge, Epsom, Caterham, and Dartford, which seem fated soon to be swallowed up in the city.

But the growth of the city is no longer to be uncontrolled. The bombing of London in 1940–41 emphasised the defects inseparable from an over-grown town and led to the decision to move a proportion of the population to satellite towns which would be created at Hemel Hempstead, Crawley, and other suitable places. The London of the future will be gradually moulded to a plan aimed at abolishing overcrowding, out-of-date housing, and traffic congestion, at avoiding the existing jumble of houses and industry compressed between road and rail communications, and at redistributing and extending the provision of open spaces.

It is difficult to define the boundaries of London. Officially, there is the administrative county, which is clearly only a part of the city now; the Metropolitan and City Police Districts, which include the City, the county, the whole of Middlesex, and parts of Essex, Hertford, Surrey, and Kent; the Metropolitan Traffic Commission's area, 2419 square miles in extent; and the Post Office districts, which have boundaries differing from the others. Meanwhile, popular parlance refers to the area comprising the City, the County, and the Outer Ring as Greater London, and, as urban development is continuous within it, this is no doubt what must be regarded as London. In this sense the great city lies within a mean radius of 13 miles from Charing Cross, covers an area of 585 square miles and contains a population of 8,528,267.¹ It therefore contains one-sixth of the population of Great Britain and has more inhabitants than the whole of countries like Norway, Switzerland, and the Netherlands.

The new town-planning will, however, both define the limits

¹ Official estimate for 1938.

and regulate the density of population. A central core within an 'A Ring Road' will be allowed a density of 200 persons per net residential acre ; around this and within a 'B Ring Road' the density will be reduced to 136 ; and beyond this belt only 100 persons in every acre used for residential purposes will be permitted. If the plans are carried out, the total population will undoubtedly be smaller.

LONDON AT WORK. In this vast community it is possible to distinguish three main groups of persons who perform the chief functions on which the existence of the city depends and who represent its chief interests, viz. those engaged in business, the working population, and the official world.

Commerce focuses in the City and its neighbourhood, in the same quarters as in the early years of history the Thames crossing and the head of the navigation had led merchants to settle. There the commercial, maritime, and financial power of London is still concentrated. In the 13th century there was, near the present site of Wood Street, Milk Street, Honey Street, and Ironmonger Lane, a permanent fair occupying a space full of booths displaying goods for sale. This was the great Cheap, or Market, the name of which is still preserved in 'Cheapside.' Today nearly all the branches of high commerce have their exchanges in and about this locality. The Wool Exchange, where public auctions are held at fixed intervals, is in Coleman Street. Drugs—camphor, ipecacuanha, aloes, eucalyptus oil, etc.—are sold in the Commercial Sale Rooms in Mincing Lane ; coal in the Coal Exchange in Lower Thames Street ; wheat in the Corn Exchange in Mark Lane ; and tea and feathers in Mincing Lane. Other branches of commerce have no formal exchange, but are mainly concentrated in certain streets. Thus most of the large dealers in diamonds and other precious stones have their headquarters in Hatton Gardens ; shell and mother-of-pearl dealers concentrate in Queenhithe ; furs centre in Lime Street, where the Hudson's Bay Company has its warehouses ; metals in Whittington Avenue ; and tobacco in Fenchurch Street. Only three of these trading centres are on the south bank, viz. dealing in hops tends to focus in Southwark, in butter and bacon near London Bridge, and in skins and leather at Bermondsey near some old tannery works. In these headquarters of the various types of commerce large spaces are crowded with offices, packing-rooms, and transport premises.

Grouped near the exchanges are the headquarter offices of shipping companies, ship chandlers, shipping agents, and ship brokers. In Billiter Street stands the Shipping Exchange, where merchants in need of ships meet shippers in need of freight. Within the Royal

Exchange is Lloyd's famous marine insurance agency, a unique institution which keeps in constant touch with the movements and activities of British ships in all parts of the world. Right next to the Tower is Trinity House, the headquarters of the organisation which maintains lighthouses, buoys, and other marks of the sea and is the chief pilotage authority in the kingdom. Not far away stand the financial institutions which hold British capital, keep it in circulation, and distribute it throughout the world, viz. the Bank of England, the ordinary banks, and other financial companies. Lastly, there is the head Post Office, that symbol of all this intense activity, whose pulse-beats are transmitted to the uttermost ends of the earth. It acts as a focus for a world-wide network of telegraphic communications, receiving and sending orders, transmitting news and financial quotations. Nearby, too, *The Times*, the city's most famous daily newspaper, collects its news from all over the world, defends the interests of British capital, and expresses the opinions of the great business centre. It has the widest circulation of all English newspapers, for its weekly edition is read throughout the Empire. High above all these great city buildings rises the dome of St. Paul's Cathedral, the religious centre of the city, in which many of England's great men of action lie buried.

The streets and buildings of this feverishly active quarter hum with the activity of a beehive. Between 8 and 9 a.m. occurs the 'rush hour,' when a stream of business men and their managers, clerks, secretaries, typists, etc., pours into town ; whilst in the evening the stream ebbs back towards the suburbs, soon leaving the City deserted. Men and women enter this part of London purely for business purposes and few actually live within its precincts. The intense concentration on business has driven people to live elsewhere and caused the buildings to be used as offices and shops.

London also contains an immense swarm of manual workers, most of whom are employed in the physical activities of commerce. There are dockers and stevedores who load and unload cargoes ; manual labourers who handle goods and move them from ship to warehouse or railway station and vice versa ; barges and employees of the railway, tramway, and bus companies ; mechanics who work the dock machinery ; warehouse keepers ; and gasworks employees. According to the Fifth Census of Production, the working population within the Metropolitan and City Police Districts amounted in 1935 to 1,411,000, as against 1,200,000 in 1930. The inclusion of dependents brings the total up to even more than 3,000,000 souls, a number which proves that London is still mainly a commercial city.

The commercial function not only dominates industry in the city, but has even hindered it. Up to about the middle of the 19th

century London engaged not merely in the industries inseparable from the life of a great town, but also in the great staple occupations. Distances from the coalfields caused factories to migrate to the Midlands and North. Shipbuilding has almost deserted the Thames, boot and shoe manufacture has moved to Northampton and Leicester, textile industries gone to Lancashire and Yorkshire, and most of the sugar refineries have disappeared. But the greater mobility and cheapness of transport due to the rise of road transport by mechanically propelled vehicles has restored London to the position of a great industrial town. In 1938 within the County alone about three-quarters of a million people were engaged mainly in productive industry, while the factories and workshops in which they were employed numbered 37,000.

The industries carried on in London and its surroundings are mostly of the 'new' type. In order of importance they were in 1938 : engineering, clothing, food (including drink and tobacco), furniture, printing and paper, chemicals. Heavy engineering is usually carried out by large industrial units and consists of foundry work, the manufacture of cranes, hydraulic apparatus, boilers, tanks, cables, and ship repairs. It is located chiefly in the riverside boroughs of Woolwich, Greenwich, Deptford, Poplar, and Battersea. Medium and light engineering is widely distributed, especially in Finsbury, Stepney, Islington, St. Pancras, Hammersmith, Fulham, Camberwell, Lambeth, Southwark, and Wandsworth. Its products include electrical apparatus and equipment, scientific instruments, printing machinery, lifts, motor-car parts, household devices, building equipment and pressed metal-work. The production of electrical apparatus is mostly located on Thames-side, since, as large numbers of its employees are women, it is complementary to heavy forms of engineering which employ men only. The clothing industry is carried on in a large number of small establishments employing 180,000 persons. It is divided into a smart West End section and an East End section which turns out cheap mass-produced clothing in large factories. Besides the manufacture of clothing, the industry includes the making of hats and caps, gloves, boots and shoes, and fur garments. The boot and shoe industry now centres in Hackney, but shows a tendency to move out to Leyton. The fur trade is located in Stepney, Bethnal Green, and Hackney, being closely associated with the fur warehouses in the City. The magnitude of the London market causes the food industry to be of great importance, employing 90,000 persons in 3300 establishments. Some of the units are large, especially those in Stepney, Shoreditch, Poplar, Southwark, Bermondsey, Lambeth, and Hammersmith, but the majority are small and widely distributed. A good many of

them are traditionally sited on the river owing to the facilities for importing 'raw' foodstuffs and their storage in the large quayside warehouses. For similar reasons the tobacco factories are placed in Finsbury, Shoreditch, and Stepney. The last named borough is the centre of the brewing industry.

Like the manufacture of clothing, the furniture industry is closely associated with big London shops and is carried on mainly in a large number of very small workshops, though there are some big factories. Easy access to the dockside timber yards and saw mills has helped to locate the industry in Shoreditch, Hackney and Bethnal Green. The printing and paper industry, which employs 67,000 persons, mainly consists of the production of daily papers, periodicals and stationery, together with photo printing, the manufacture of cardboard boxes, printer's ink, and other ancillary trades. It supplies the needs of Fleet Street area, the Law Courts, and London commerce generally, but does not deal to any large extent with literary printing. Chemical industries are growing in importance. Most of the heavy section is located in the Outer Belt, since it has not been affected by tradition; but those connected with oil refining, gas generating, oil-cake preparation, and other manufactures requiring imported raw materials are naturally attracted to the riverside and are centred in Greenwich, Poplar, Bermondsey, Battersea, and Wandsworth. The light chemical industries, which manufacture such commodities as patent medicines, beauty preparations, and drugs, are scattered in small establishments in Finsbury, Stepney, Hackney, St. Pancras, Camberwell, and Lambeth.

Congestion of industry is severe in boroughs like Poplar and Stepney, causing slums, blocking the streets with traffic, and greatly raising the value of land. With the rise of cheap road traffic, which released the old bonds which tied industry to the riverside, there has been a tendency for factories to move out of London. This has been particularly noticeable in the furniture trade, especially since metal and plastics have been displacing wood in certain sections of the industry. But certain activities, like the clothing and light chemical industries, do not show much sign of developing the tendency. In view of the danger of concentration of industry in case of attack from the air, the policy of the central Government is to spread factories as much as possible, a policy which will support the tendency to move out of London.

Information as to the effects on industry in the city of the war of 1939-45 is not yet available, but undoubtedly the destruction of warehouses and workshops and the evacuation to 'shadow' factories have led to a permanent reduction in the city's industry. In cases where the location of an industry on Thames-side was due

to mere tradition, the advantages of decentralisation will almost certainly operate against a return to London.

In spite of all efforts at slum clearance, the overcrowding is great in Shoreditch, Whitechapel, Limehouse, and Bethnal Green. In these working-class districts the seemingly endless, dark, narrow, evil-smelling streets swarming with ragged children present a sordid picture of drab monotony. Yet amidst all this poverty, squalor and suffering there is much gaiety and life. Cockney humour is proverbial. In the evenings and especially on Saturdays, the streets are filled with an extraordinary crowd. In the roadway are erected booths at which are sold second-hand goods, mainly shoes, clothing, ironmongery, and furniture. With these compete the wheelbarrows of the costermongers, whose main commodity is fruit. Then there are street performers' shows, music halls, and cinemas, whose lurid fronts blaze with light. All this gives an impression of exuberant life. It should be added that some of the East End districts contain a large number of Chinese, negroes, Jews, and Italians, who collect in quarters appropriately known as Chinatown, Little Italy, and so on.

The people engaged in commerce and in manual labour supply the material power which creates wealth. But, being the capital of a mighty Empire, London contains an administrative element which forms the intellectual machinery of British rule. The three main groups of the community occupy different and well-defined quarters of the city. Whilst the working population lives in the east, the administrative element occupies the western portion of London, where the present City of Westminster has grown up round Westminster Abbey. The ford near which the Abbey was built was the chief Thames crossing before London Bridge was built. The Abbey became a centre of wealth and culture and from the early Middle Ages collected around it the flower and strength of the nation. The adjoining palace, built by the Norman kings, associated secular with spiritual power, and palace and abbey together became the political heart of the country, with which the life of the nation has always been closely connected. Westminster Abbey is used as a shrine in which a number of England's great men are buried. Next to it stands the palace, now the Houses of Parliament, overlooking the black water and muddy banks of the Thames, and farther back from the river among green parks are the royal residences of St. James' and Buckingham Palace, as well as the principal Government Offices. Nearer the city and between the administrative and commercial quarters are the Law Courts and the Inns of Court. Sumptuous mansions whose occupants for centuries monopolised admission to the royal palaces, the Govern-

ment Offices, and the Courts of Law still stand round the parks. There, too, in Pall Mall, Waterloo Place, St. James's Street, and Piccadilly are the clubs, those comfortable and distinguished centres in which men gather, according to their leanings and professions, and contribute to the formation of public opinion.

The newspapers, whose offices line Fleet Street, and the publishing firms, which have made London one of the world's great centres of printing and publishing, are also agents of national thought. Then there are the West End theatres; the smart shops in Bond Street, Piccadilly, Regent Street, and Oxford Street, which display the wonders of English taste; and, lastly, all the institutions of arts and sciences, which preserve the treasures of art and learning, viz. the British Museum, the National Gallery, the Natural History Museum, and the Imperial Institute, together with other museums, academies, and the headquarters of learned societies. Among these must be mentioned particularly the University of London, whose 16,000 students are drawn from all parts of the Empire, and the Royal Geographical Society, whose work has for more than a century been identified with the expansion of the British Empire and the advancement of knowledge of the Earth.

THE MATERIAL LIFE OF LONDON. The feeding and maintenance of London's vast population of eight million souls presents a formidable task. As the city grew, the water supply had to be increased. For centuries the wells sunk into the gravel, sand, and clay of the underlying rocks were sufficient, but at length the increasing number of houses made this source dangerous. The spread of the Great Plague of 1665 has, not without reason, been attributed to the use of contaminated water. But steps had already been taken to bring a supply from a distance, and at the beginning of the 17th century an aqueduct was built to lead water from Chadwell and Amwell in the Lea Valley. The use of the water from the New River, as the aqueduct was called, became general towards the end of the century. But soon this supply became inadequate, and artesian wells were bored in the chalk, first in the Lea valley, then in Kent. Finally, the Thames itself was requisitioned. The water is taken from the river at Staines above the limit of the tide at Teddington. It is filtered in huge reservoirs which provide 57 per cent. of London's water supply. Since 1904 the whole of the business of supplying water to the city has been in the hands of the Metropolitan Water Board, which distributes the colossal amount of more than 309 million gallons a day. The abundance, or rather the plethora, of water constitutes one of the material advantages of London. For this reason the city may be regarded as one of the healthiest in the world. The sweeping of the Thames by the tide

twice a day also gives the city the advantage of an excellent drainage system. Since 1859 the sewers all run into two collectors, one on each bank, and these discharge into the river. Thus, every day the ebb tide carries out to sea nearly 2,000,000,000 gallons of polluted water. But the Thames is fouled and contains in its estuary nothing but filthy water impregnated with disease germs.

The conditions of life among the masses have considerably improved in London during the last fifty years. Between 1890 and 1928 the index of the cost of living rose from 100 to about 185, whilst the average wage increased by 116 per cent. The purchasing power of the working man has thus risen by about 20 per cent. The sufferings of the poor have been relieved by the development of social work. Since the war of 1914–18 London has suffered less than the rest of the country from unemployment. Generally speaking, the standard of life has risen. The amount spent on tobacco increased fourfold between 1890 and 1930. The taste for amusement has spread. In six boroughs inhabited by a working population of about a million persons there were eighteen cinemas and music halls in 1891, whilst in 1929 there were fifty-nine cinemas, though only five music halls survived. Overcrowding has greatly decreased, for since 1918 there has been much building of new houses in the suburbs; and, moreover, the development of the means of transport has helped in slum clearance. Every increase in mobility widens the area in which workmen can choose to live, whilst imperfect mobility begets overcrowding.

The mortality rate continues to diminish in London, but so also does the birth rate. The appearance in the 20th century of a generation which has gone to school regularly has caused an improvement in hygiene. Unfortunately, though London is, as was said above, a healthy city, there are drawbacks to health in the lack of sunshine, the fogs, and the smoky atmosphere. The extent of the last is shown by the fact that more than 30,000 tons of soot are deposited annually on the county area of London. But much has been done to lessen the smoke and purify the air.

Large quantities of foodstuffs from all parts of the world are landed every day in London. For not a little of these imports London acts as a market from which the food is distributed. Most of the suburban areas and even the neighbouring counties draw their supplies of butcher's meat from the city's great meat market at Smithfield, their fruit and vegetables from Covent Garden, and their fish from Billingsgate.

The government of the huge city is a problem no less imposing than that of its food supply and hygiene. Until well into the 19th century the districts of London which lie outside the City were

separately administered by a number of vestries. The first step towards union was the establishment of the Metropolitan Water Board, which was founded in 1859 to administer the sewage system. It was not until 1899 that the Metropolitan districts were organised as twenty-eight Boroughs and the whole placed as an administrative county under a single local authority. Thus constituted, London had an area of 117 square miles, the boroughs being formed of portions taken from Middlesex, Kent, and Surrey. In 1945 the County of London contained an estimated population of 3,300,000.

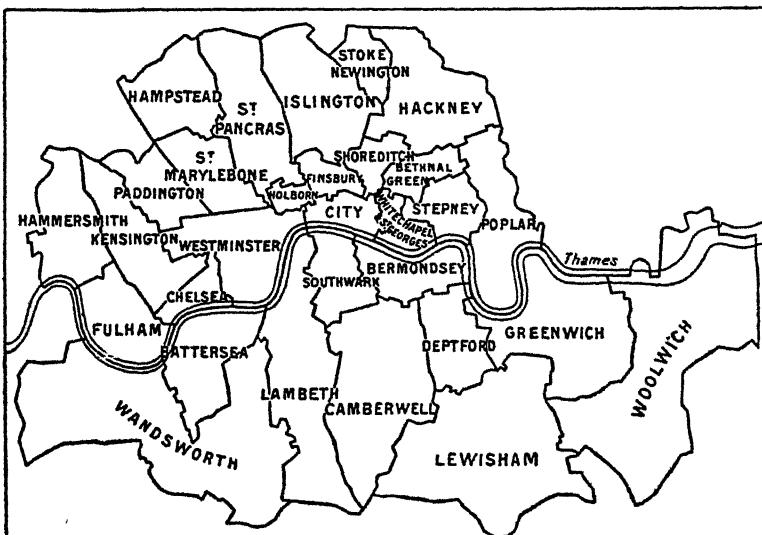


FIG. 70. The City and the County of London, showing the 28 Metropolitan Boroughs.

Its local authorities are borough councils, consisting of a mayor, aldermen, and elected councillors, the whole being subordinate to the London County Council, whose members are also elected. Outside this reorganisation stands the City, which still retains its traditional administrative system and is almost independent of the L.C.C. It has its Lord Mayor, Aldermen, and Common Council elected according to ancient custom; its sheriffs, its police, its law court, and its ancient privileges. Its area covers one square mile and its population numbers 9380. The Outer Ring, which includes the county boroughs of East Ham, West Ham, Croydon, and Ealing, together with 31 Municipal Boroughs and 16 Urban Districts, is still under a large number of separate local authorities.

4. THE TOWN

Two topographical features have mainly contributed to the growth of London. The first is the Thames valley, a trade route

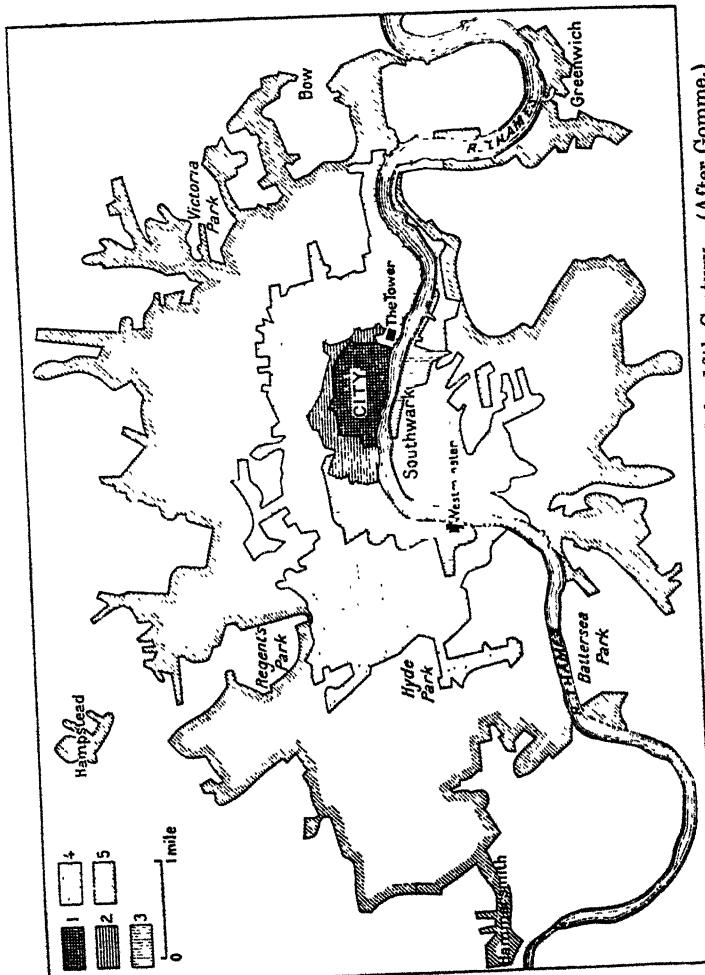


FIG. 71. Growth of London since the Middle of the 16th Century. (After Gomme.)

- 1. The City as it was in the Middle Ages, confined within its walls.
- 2. Expansion about 1560.
- 3. Expansion about 1668.
- 4. Expansion about 1799.
- 5. Expansion about 1832.

along which settlements were made, although the valley bottom itself was long uninhabited owing to its swampy nature. The second is the high ground formed by the end of the Barnet-Highgate ridge on the north bank of the river, which affords a dry, firm site for human settlement. London Bridge, St. Paul's

Cathedral, and the Tower were built on the highest ridge of this terrace between the little valleys of the Holbourne and Walbrook (see Fig. 71). These features controlled the expansion of London right up to the middle of the 19th century. The two historic portions of London, the City and Westminster, stand on the left bank of the river a mile and a half apart. The first expansion of the City was in the direction of Westminster, and in the reign of Elizabeth a row of houses along the Strand joined the two towns. On the same bank opposite the Pool there gradually grew up a quarter occupied by working people and seafaring folk. By the end of the 17th century London was expanding away from the river on the north bank from Westminster, where the western portion of the city was already taking shape, to the shipping quarter, where the East End was beginning to appear. The most densely peopled part was the City, which stood near the Bridge and between the two 'ends.' On the south bank there was nothing but a line of houses in Southwark.

The 18th century set the seal on the greatness of London as the political and economic centre of the British Empire, and the city began to grow rapidly. It developed more freely and expanded away from the Thames towards the open spaces in the west. A spate of building took place, somewhat like that of the mushroom towns in the Far West of the United States. Nearly all the districts round Piccadilly and Hyde Park, as well as those in Marylebone as far as Regent's Park, date from this century. No town in Europe has added such large areas so quickly. The westward expansion was imposed by natural conditions, for in the east the low, damp ground along the Thames and Lea was still shunned, and, moreover, by expanding westwards the city escaped from the smoky, ill-smelling quarters in the east and moved into the clean, refreshing air of the prevailing southwesterly winds. Everyone who was not compelled to live near the port went to dwell farther upstream. The city still retained its basic plan during this phase of its expansion for at the beginning of the 19th century the main portion of the town was still on the north bank and contained two-thirds of the population. Between 1801 and 1851 South London increased by 400,000 inhabitants, whilst the quarters north of the river increased by a million, and the City still contained one-third of the whole population.

From the middle of the 19th century a remarkable change came over the growth of London. The original plan was effaced, and the former structure disappeared, for a vast expansion took place in all directions. The result has been the development of an urban monster in which the original features no longer exist.

This change was due to the improvement in the means of transport and in the roads, which enabled the ever-growing number of inhabitants to move away from the centre of the city without suffering inconvenience from the distance. Since 1850 London has been the focus of the main railway lines in the country. Within the city the traffic has increased owing to the construction of modern means of locomotion. On the local railway lines built to North and East London the number of workmen's trains was fifteen times greater in 1910 than in 1880. The Metropolitan and District Railways, constructed after the middle of the century, ran round the outskirts of the city as it then was and extended their branches to the suburbs. Tunnels were made under the Thames in 1843 and 1870. The tubes, which were started in 1890, have spread to the suburbs, and the tramways, which still serve some of the poorer districts, though they have largely been replaced by trolley-buses, doubled their mileage between 1900 and 1910. In 1924 there were 610 railway stations within a radius of 15 miles of Charing Cross. Within the circle of Greater London the public transport services were estimated in 1910 to have carried 1600 million passengers as against 116 million in 1871. Today London has a wonderful system of motor-bus services, some of which run far beyond the suburbs. In fact, the motor-bus has ousted the tram and has become more important than all other means of transport, for in 1946 bus services carried more than half the passengers in Greater London. The number of passengers carried by buses rose from 264 million in 1900 to 1,912 million in 1929, and to 2,487 million in 1946.

Improved transport facilities have profoundly modified the distribution of population. Whilst the central districts are being emptied, the suburbs are rapidly expanding. The rate at which the City is losing its inhabitants is shown by the decrease in its population from 129,000 in 1851 to 19,000 in 1911 and 13,000 in 1921. The tendency to outward movement has also affected the other central parts of London, chiefly Holborn, Westminster, Finsbury, and Marylebone, though without attaining such huge dimensions. Since 1901 the population of the County of London has been decreasing, and from a total of 4,522,000 persons in 1911 it fell to 4,397,000 in 1931. On the other hand, Greater London has increased its population from 2,680,000 in 1851 to 6,581,000 in 1901, and 8,203,000 in 1931. These tendencies have been greatly increased by the effects of the war of 1939-45. Administrative boundaries are powerless to restrain the magnitude of this expansion, which every day invades new areas. Since 1918 the sea of houses has overwhelmed large areas of rural land and created the huge Outer Ring of suburbs which form an

integral part of the city. Here the cottages, gardens, orchards, and fields have disappeared, and in their place have sprung up rows of suburban houses and garden cities, interspersed with spacious sports and recreation grounds. Many of London's scientific institutions are to be found here, including the national observatory at Greenwich and the Botanical Gardens at Kew. There are also a number of educational establishments, among which is the famous public school at Harrow. In the outlying suburbs there are the Royal Castle at Windsor with Eton College nearby, the Prime Minister's country residence at Chequers, and the ancient city of St. Albans, where many traces of the Roman occupation occur.

As a general impression it may be said that the appearance of London may be summed up in two words: monotony and size. Except in the newer suburbs there is little outward sign of imagination or originality, and there is none of the variety such as that owed by Paris to its mixture of old and new architectural styles, the juxtaposition of old quarters with narrow alleys and new quarters with spacious streets, and to the multiplicity of individual tastes in house design. This general sameness is due to the comparatively recent date of most of the city. The Great Fire of 1665 destroyed 15 wards, 400 streets, 13,400 buildings, and 89 churches. The city was then rebuilt on a new and more regular plan in which hygiene and safety counted for more than the picturesque. The result of this wholesale building was uniformity. Monotony was also encouraged by the ownership of most of the ground space in London by a very small number of landlords. Whenever a period of expansion gave assurance of a rush of tenants, huge lots of ground were rapidly built over. To finish the building quickly and cheaply, swarms of houses were constructed on the same plan and, in consequence, looked as if turned out of the same mould. Whether intended for the working man, the middle-class resident, or even the nobility, the houses all repeated the same basic form, though perhaps with various types. Owing to this the city is marked by an insipid impersonality. The external masonry has a uniformly drab appearance. The frontages of the fine stone buildings are soiled by smoke, fog, and rain, and the beauty of their architecture is spoilt by the greyish or blackish tinge which impregnates them. As far back as the 18th century Ferri wittily expressed his impressions of their uniformity: 'In England all the houses are alike. This has given rise to the saying that the English have expelled the monks from their island and have built a great convent which contains nothing but cells of the most monotonous uniformity. And it is possible to mistake one's neighbour's house for one's own.'

The great destruction of buildings by air attacks during the war

of 1939-45, especially in the City, affords the first opportunity for extensive rebuilding and replanning since the Great Fire of 1665. It remains to be seen what use is made of this opportunity.

To these impressions must now be added those which arise out of the very size of the immense city. The area of the County of London is nearly four times as big as that of Paris, but has only twice the number of inhabitants. This is partly due to the English custom by which each family occupies a whole house. Large buildings of six or seven stories are found only in the central parts of the city and in Westminster, Whitechapel, and Southwark, where the high ground rents compel houses to be tall. But elsewhere the type of house found in London is intended for the use of a single family and contains eight residents on the average, as against thirty-four in Paris. This custom has forced the city to spread out over a wide space. Modern conditions, however, have led to an increasing tendency to the construction of large blocks of flats, each of which may house anything from a hundred to two hundred families.

Another cause of the huge area covered by London is the large space given up to parks, whose wide open spaces of grass dotted with trees have been called the lungs of the city. They occupy more than 4151 acres within the County alone, and, besides allowing light and air to reach the City, they form pleasant resorts which bring a touch of delicious freshness and nature into the sea of bricks and mortar. Altogether there are fifty-one parks, of which thirty-eight are administered by the L.C.C. The largest are Richmond Park which with Kew Gardens contains 2,646 acres, Bushy Park with 1100 acres, Hyde Park and Kensington Gardens with 635 acres, and Regent's Park and Primrose Hill with 535 acres. In the poorer quarters in the East End are Victoria Park and Hackney Marsh, and in South London are Blackheath, Tooting Common, Battersea Park, Richmond Park and Kew Gardens, and Clapham Common. In North London, besides Hampstead Heath and Ken Wood, there are Finsbury Park, Wormwood Scrubs, and Gunnersbury Park. In the West End, Hyde Park and Kensington Gardens, the Green Park, and St. James's Park afford a continuous walk of nearly three miles over grass and paths under the shade of magnificent trees.

Hyde Park, which is typical of the London parks, is a combination of woods, gardens, and open grass fields. Old trees recall the days when there was hunting in the forests, but now sheep graze on the thick turf. Special portions are devoted to recreation grounds for children. On other parts, which are reserved for games, cricket or football is played ; and in quiet corners groups of idlers sleep in the

sun on fine summer days. Numbers of men and women may be seen riding along Rotten Row, an avenue which is bordered with flower-beds. On Sundays popular orators take their stand in the shade at the path junctions or on the turf and address open-air meetings. Sometimes the quiet is broken by the march of a large popular demonstration.

The parks are scattered about the city and help to avoid over-crowding by forming open spaces among the houses ; but by bringing pieces of the countryside into the town they help to increase its area. A public subscription to set up a memorial to King George V is being partly used to establish a 'Green Belt' just outside the Outer Ring. When this is completed, the area of public parks will be enormous.

These features of the city are spreading day by day over the whole area of Greater London and already pass far beyond the administrative boundaries to the outer limits of the city's influence. All round London, and sometimes a long distance from it, are other towns which are, as it were, colonies, annexes, or tentacles of the city. Some of them are complementary to the functions of the metropolis, e.g., Woolwich is an arsenal and Chatham and Sheerness are organised for the defence of the Thames estuary, whilst Dover and Portsmouth are protective outposts in other directions. A number of towns are auxiliaries of the great port on the Thames. The vast crowd of goods traffic on the river makes London unsuitable for fast steamship services, and, consequently, many outports are required. Passengers embark at Harwich and Dover for Belgium, the Netherlands, and Northern Europe ; at Dover, Folkestone, and Newhaven for France, and at Southampton for North America, South Africa, and France.

The industrial activities of the city show a tendency to move to the outskirts, and even to towns some distance away. This is partly due to the high ground rents and rates in London, but also to the facilities of modern road transport, which has enabled industry to move away from the riverside, and to its cheap water transport. Factories and workshops are now being erected not in the city itself, but in the Outer Ring, in satellite towns like Uxbridge, Watford, and St. Albans, and even as far away as Luton, Hatfield, and Bedford. This applies not only to general industry, but also to factories which are intended particularly to cater for the needs of the population of London or of the city's trade. Large paper mills and breweries on the Darent and Medway in Kent, especially at Dartford and Maidstone, supply customers in London.

Equally dependent on London are all the holiday and seaside resorts and places associated with various forms of sport and recreation, which are crowded with Londoners in the season. Some

of these are on the Thames : *e.g.*, Kingston, Windsor, Maidenhead, Henley, and Reading. Others are on heaths or in woodland districts, like Epsom and Tunbridge Wells. Finally, there are the numerous coast towns, such as Leigh, Southend, Margate, Ramsgate, Hastings, Eastbourne, Hove and Brighton, which are connected with London by fast train services. In fact, the whole of the south coast is but a single holiday resort for a great part of the population of London.

Considering the variety and extent of the geographical relations which exist between the city and the surrounding regions, it may be said that London is not a town, but an urbanised district, for it includes not only the eight and a quarter million people who live under the immediate protection of the Metropolitan police, but extends its influence over the whole of the southeast of England. Modern means of transport link together the geographical monster whose powerful influence is such that one must go as far afield as Norwich, Birmingham, and Bristol to find towns which lead an independent existence. The basic source of the city's strength does not spring from the locality alone, but from the world-wide relations which have been fostered for centuries. London faces the Continent and looks out over the British Empire. Unlike many of the towns in industrial England which are of purely national growth, London draws its strength from overseas and is the outcome of world trade. This is the true origin of the immense city which bears a size so disproportionate to that of the country in which it is situated.

PART III

ECONOMIC AND IMPERIAL GEOGRAPHY

CHAPTER XIII

ECONOMIC GEOGRAPHY OF THE BRITISH ISLES

FOR centuries past the economic system of the British Isles has been permeated by a spirit of commercial enterprise which has determined the forms of human activity, guided production, and even moulded the community. Its imprint has been left on every social class in the islands, and it has been the determining factor in the evolution of both agriculture and industry. Nothing in the country—neither the methods of farming, the kinds of product got from the soil, the appearance of the countryside, nor the condition of the agricultural classes—is due to purely indigenous causes : everything has undergone external influence. To feed the teeming industrial population which worked to supply overseas markets the old system of agriculture had to be abandoned, and the new methods adopted have given a return ten times as great as the old. The importation of corn from abroad has caused the arable to be turned into pasture. Smallholdings have been swallowed up by large estates formed out of the profits derived from commerce. The attraction of the industrial towns and ports has emptied the villages, and cities have grown at the expense of the depopulation of the countryside. All these features of the economic and social life of the islands belong to a type of civilisation which is not purely British, but developed earlier and with greater intensity in the British Isles than elsewhere.

World trade made England into the land of inventions and the cradle of large-scale industry. The effort to produce more and better goods induced her industrialists to replace handicraft by mechanical devices, waterwheels by steam engines, charcoal by coke in the production of pig iron, and puddled iron by steel. The Industrial Revolution began in the cotton industry, which was dependent on colonial trade ; and the effort to supply more and more extensive and distant markets led English manufacturers to adopt technical inventions. No material was better suited to the new machinery than the light supple fibre of the cotton plant, and this newcomer from tropical lands immediately took the leading place in manufacture, ousting wool, the ancient product of the British Isles. From that time on, industrial production requiring

larger and larger markets was closely associated with commercial expansion which called for an increasingly intense production. This trade was not only the cause of British expansion overseas, but

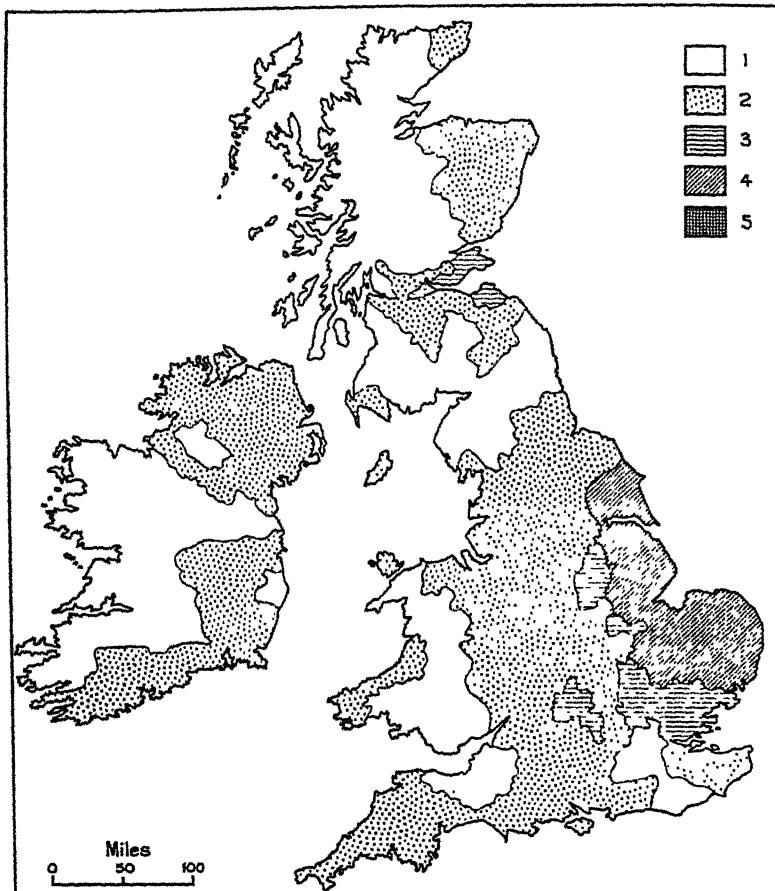


FIG. 72A. Distribution of Corn Crops, 1926. Percentages of corn crops in the total area of each county:—1, 0-5; 2, 6-15; 3, 16-25; 4, 26-40; 5, more than 40. (Maximum, 35, in Cambridgeshire.)

also the powerful driving force of the whole British economic system.

1. AGRICULTURE

THE EVOLUTION OF FARMING. For ages grain and wool were the staple products of British agriculture. Today, however, foreign

competition has bereft them of their traditional place in the economic system. The foundations of the old agricultural system were shaken, especially from 1875 onwards, by overseas countries

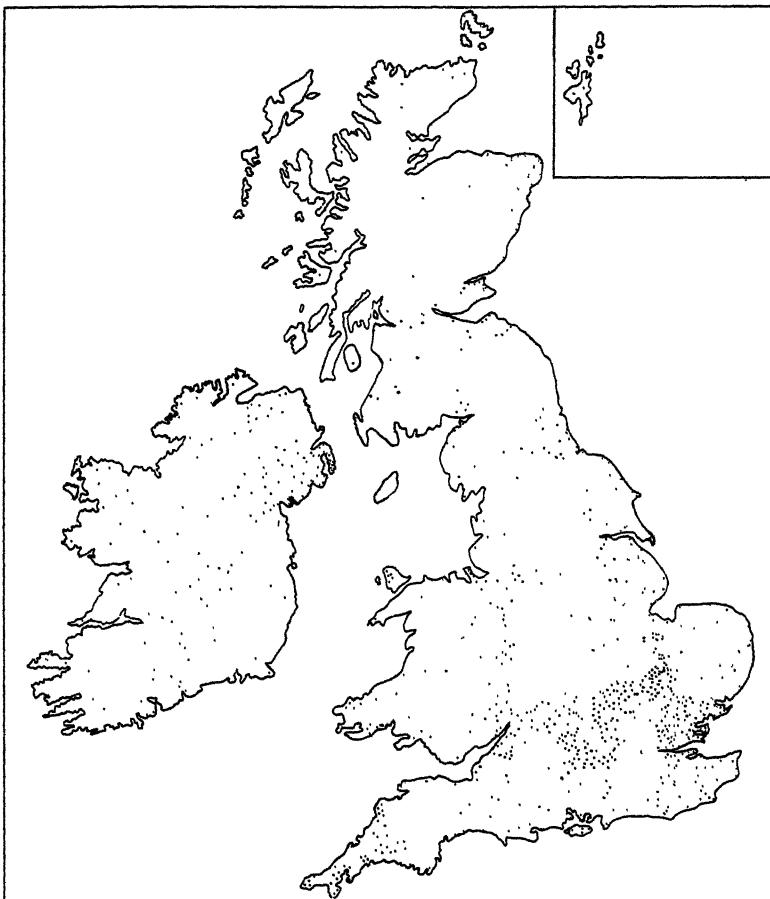


FIG. 72B. Distribution of Cereals, 1947. 1 dot = 2,000 acres.

where production was cheap and which had cheap ocean transport at their disposal. In the thirty years between 1875 and 1905, the price of corn fell by more than 40 per cent., and this compelled farmers to abandon crops which no longer yielded a profit and to turn their arable into pasture. Between 1871 and 1939 the acreage of arable land in Great Britain decreased from 18,400,000 to

11,900,000. Much of the area thus lost to the plough went to increase the acreage under permanent grass, which rose from 12,800,000 in 1871 to 17,300,000 in 1939. This was largely due to increasing

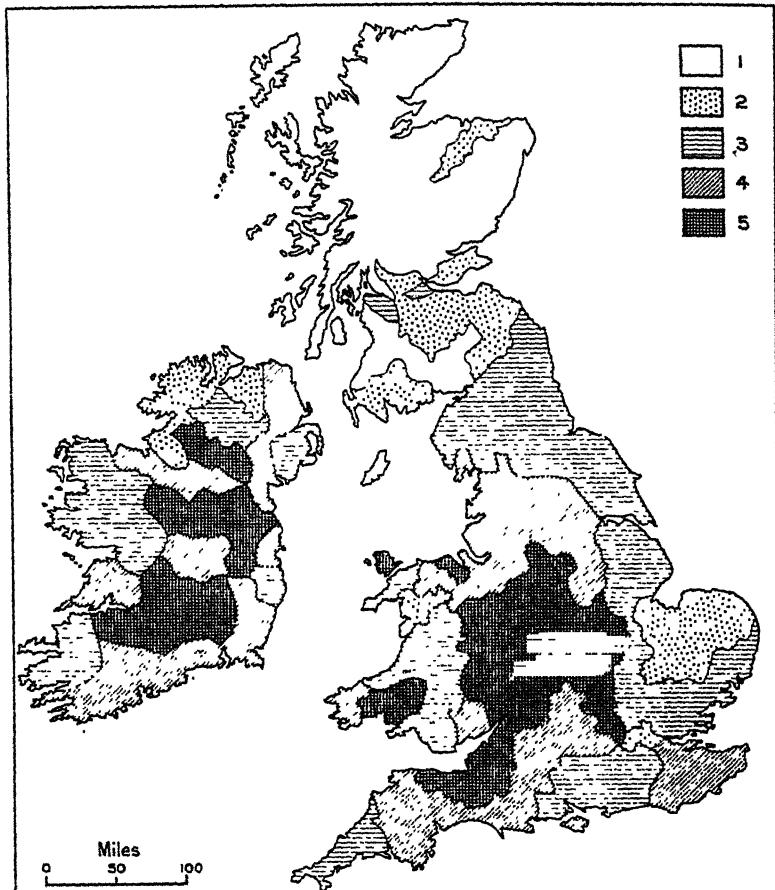


FIG. 72c. Distribution of Permanent Grassland, 1926. Percentages of permanent grass in the total area of each county :—1, 0-10; 2, 11-25; 3, 26-40; 4, 41-55; 5, over 55. (Maximum, 71, in County Meath.)

labour costs and the growing advantages of concentration on milk production. But the total area of farm land decreased in the period owing to the increasing use of land for industry, housing, roads, airfields, and other non-agricultural purposes. About 1840 the British wheat crop could still supply 90 per cent. of the population, whilst in 1939 it was hardly large enough to feed 13 per cent. Large-scale wheat cultivation tends to be localised mainly in the fertile,

warm, sunny eastern counties. In 1939 the acreage under the crop in the United Kingdom had fallen to 1,766,000. This decrease was due to the fact that cereals can be produced more cheaply in many

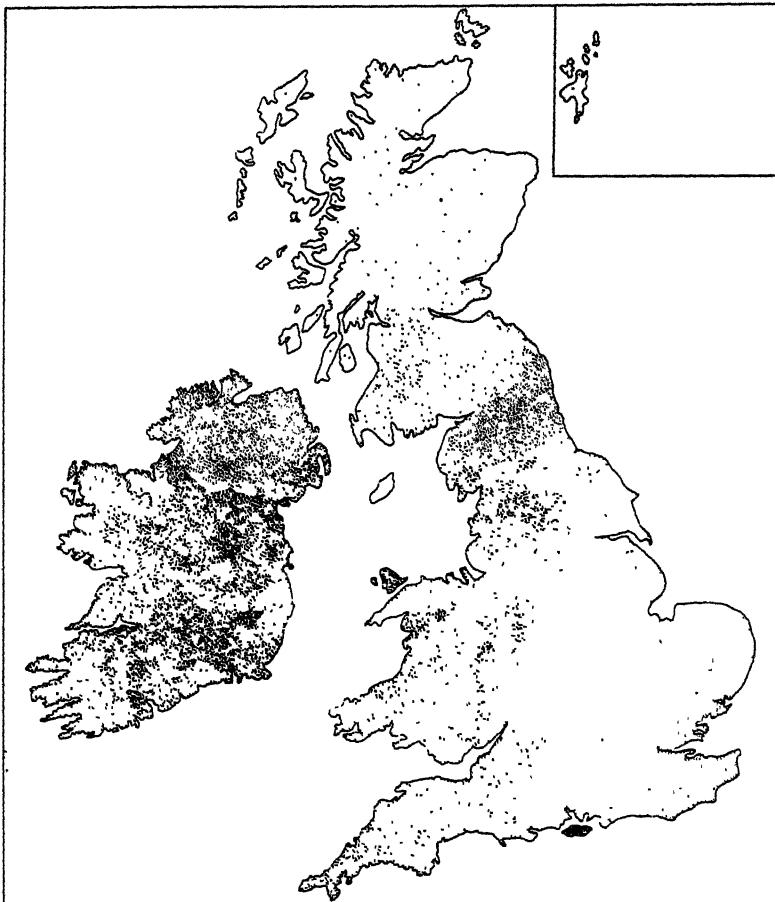


FIG. 72D. Distribution of permanent Grassland, 1947. 1 dot = 1,000 acres.

of the 'newer' countries where agriculture is on an extensive system and the climate drier and sunnier. It is noticeable that the British oat crop did not lose so much ground as wheat and barley, since it is hardier and can grow in conditions of greater damp. The arable lost also on root crops, since the use of those for feeding animals was replaced by that of imported oil seed cake and meal and other foods.

But while Great Britain decreased the acreage of ploughland, she did not cease to be a large producer of sheep ; a fact which still distinguishes her from other European countries. The Islands are

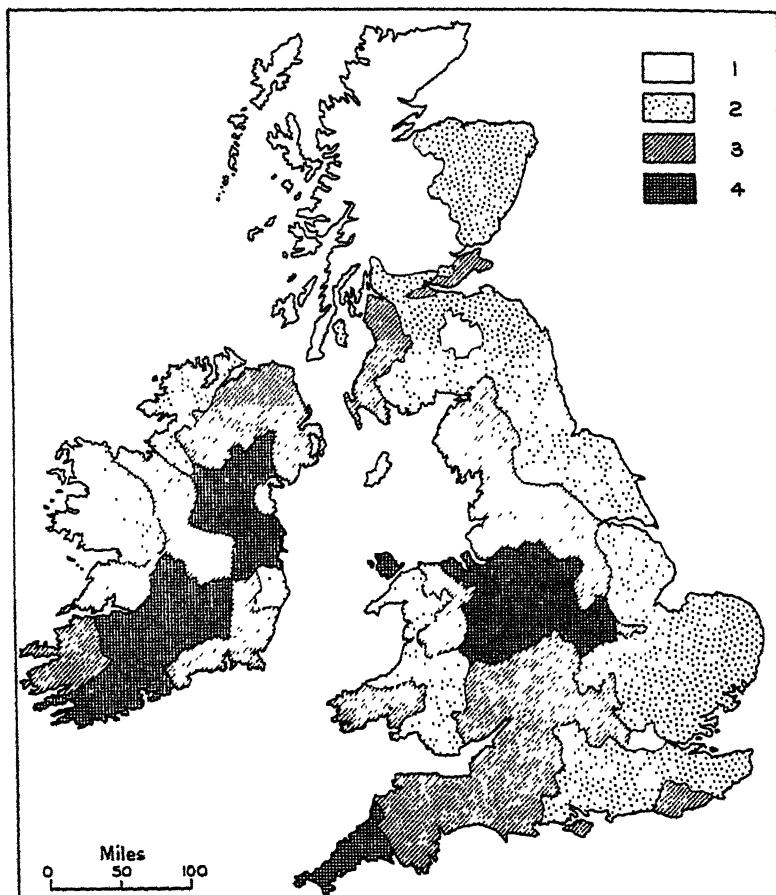


FIG. 73A. Distribution of Cattle, 1926 ; number of Head per 100 Acres :—
1, 0-5 ; 2, 6-15 ; 3, 16-25 ; 4, more than 25. (Maximum, 40, in County Limerick.)

particularly favourable to sheep-rearing on account of the large expanse of moorland and natural pasture, the mildness of the climate which for many months allows animals to remain in the open, and the abundance of green crops. Scotland alone has one-third of the total number of sheep in the British Isles. Whilst in France and Germany the number of sheep has been declining, in Britain there was no great decrease before the outbreak of war in

1939. The 33 million sheep in the country in 1871 had only very slightly fallen below 27 million in 1939.

Under the pressure of the world market, in which the British

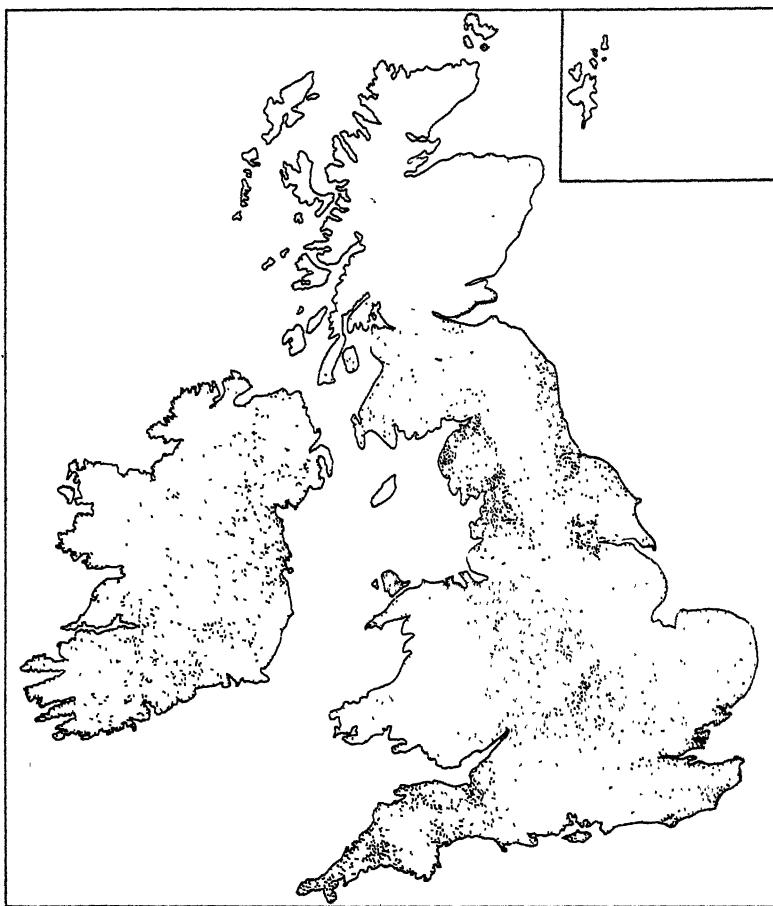


FIG. 73B. Distribution of Cattle, 1947. 1 dot = 1,000 animals.

farmer is handicapped by having to preserve his land, while his overseas competitor has been able recklessly to use up the fertility of the soil, agricultural production has constantly tended to increase the area of pasture and meadow by putting the arable under grass, and to produce milk and meat instead of corn and wool. The moderate amount of sunshine and the uncertainty of the time of its incidence, together with the damp atmosphere, have facilitated the

extension of the area given up to grass. Furthermore, owing to the cool summers, many parts of Britain are situated on the extreme limit of cereal cultivation ; and hence the ripening of the grain is a

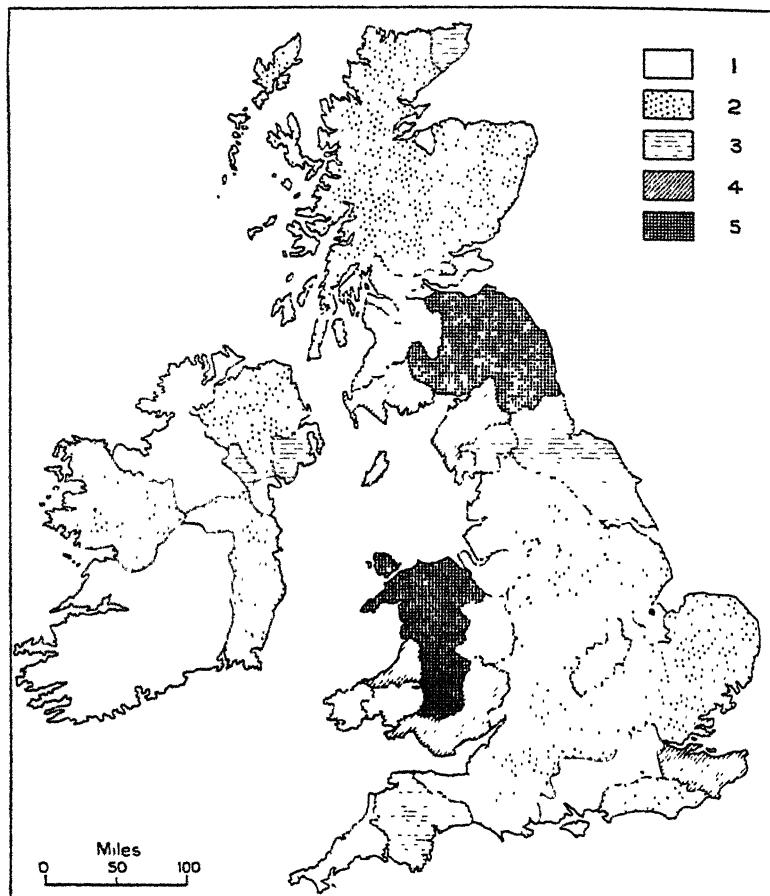


FIG. 73c. Distribution of Sheep, 1926 ; number of Head per 100 Acres :—
1, 0–5 ; 2, 16–40 ; 3, 41–60 ; 4, 61–80 ; 5 more than 80. (Maximum, 136, in Roxburghshire.)

precarious matter. As a result of all this and of the increasing cost of labour, the acreage under pasture increased between 1871 and 1939 by more than 4 million.

This trend implies an increase in the number of animals ; but, in fact, the proportion of beasts to area of grass has also risen. The number of cattle (see Fig. 73) in the British Isles increased from 9,200,000 in 1870 to nearly 12 million in 1922 ; and, omitting the

figures for Eire, it rose from 7,764,000 in 1923 to 8,900,000 in 1939. The tendency has been stronger and has acted more quickly in some districts than others. Thus, Ireland, the 'Emerald Isle', where

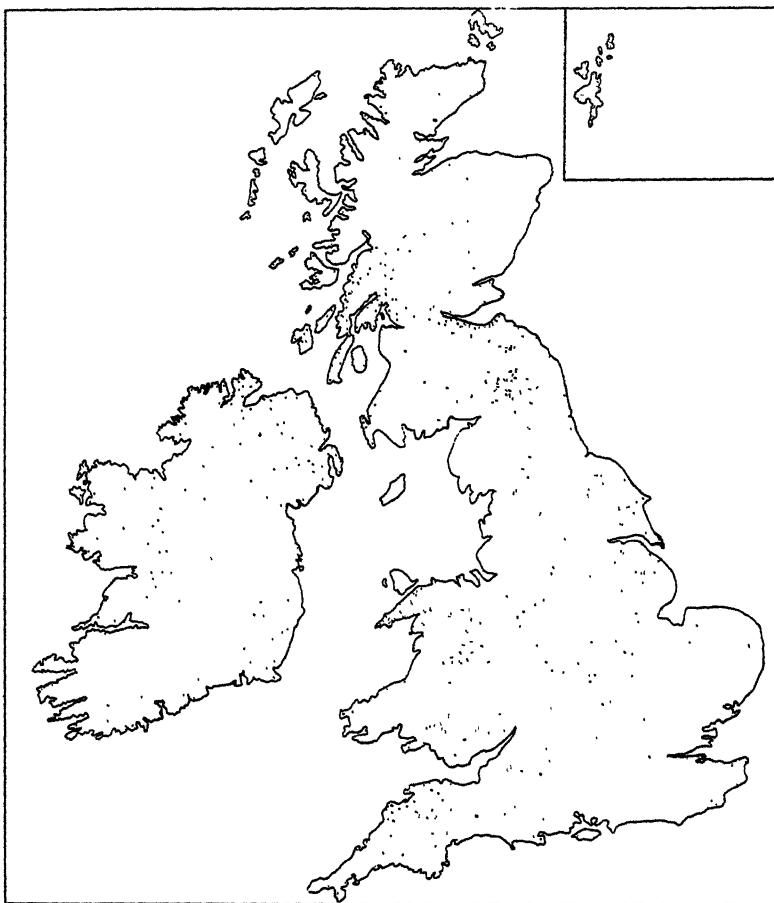


FIG. 73D. Distribution of Sheep, 1947. 1 dot = 3,000 sheep.

two out of every three acres of arable are under grass, contains nearly as many head of cattle as England. In the latter country the west contains the grazing counties, as distinct from the corn counties in the east. In a belt of country extending from Devon and Somerset to Northumberland permanent pasture covers two-thirds of the arable. Here is to be seen the typical English landscape, in which fields of grass, divided by hedges, stretch right to the horizon. Only

by raising live-stock have British farmers been able to hold their own in the home market, which they still supply with three-fifths of its meat, one-third of its butter, and nearly all its milk. One of the chief tendencies in stock-farming has been the great increase in dairy cattle to meet the growing demand for fresh milk, which is a commodity not easily imported. Another striking change has been the decrease in the number of horses from 1,601,000 in 1921 to 1,083,000 in 1939 and 917,000 in 1944—due not only to the decrease in acreage ploughed, but also to increased mechanisation, and during the war to shortage of fodder and other temporary factors.

Certain kinds of produce which were formerly of small account now find a large market in the towns and bring a profit to the farmer. Thus, the total value of eggs and poultry produced in 1939 exceeded that of the wheat crop, and there are farms in Kent and Sussex which concentrate almost wholly on the raising of poultry. But a shortage of food due to the war caused the number of birds to be reduced from 74,350,000 in 1939 to 55,130,000 in 1944. In 1939 there were more than 4 million pigs; but these were of breeds that could be readily turned into pork and not of the standard types required by bacon-factories. In 1944 the number of beasts had fallen to less than 1,900,000. In some districts vegetables and fruit have taken the place of grain, and in the thirty years between 1870 and 1901 the area devoted to fruit was doubled. Large plantations of apple, plum, and cherry trees and of gooseberry and raspberry bushes are cultivated not only in the sunny parts of southeastern England, but also in certain districts where cultivation is intensively carried on in small holdings, viz. near Evesham and Wisbech in England ; near Cork in Ireland ; and even in Scotland on the fertile soil of the Carse of Gowrie. Throughout the British Isles farming is regulated less by the quality of the soil than by the marketing conditions, and the farmers concentrate not on necessary foodstuffs, but on produce which requires rapid transport to market and finds a ready sale.

Methods of cultivation changed with the character of the produce. The needs of the vast populations which grew up in the towns and the demand for a greater supply of food caused the abandonment of the practice of fallowing, which had led to a waste of time. From 1730 onwards, two fodder crops, turnips and clover, assumed a predominant position in the rotation system ; and, as they afforded an abundance of food for the stock, produced large quantities of manure, kept the ground free from weeds, and refreshed the soil, their introduction was no less than an agricultural revolution. Turnips formed the mainstay of farming in Britain and were cultivated in all districts as a winter food for both cattle and sheep.

The crop often covered an uninterrupted stretch of several fields, and the area occupied by it and by clover and other fodder crops was equal to the sum of the areas planted in wheat, barley, and oats, a fact which demonstrated the universal importance of stock-raising. But roots are expensive of labour, and increasing reliance was placed on imported feeding-stuffs. As a result, the area under turnips, swedes and mangolds decreased from 1,711,000 acres in 1918 to 920,000 acres in 1939. War-time needs revised the acreage to 1,109,000 in 1944.

Since 1923 a new crop has gained an importance in English agriculture. Sugar-beet occupied a mere 4,000 acres in the United Kingdom in 1913 and only 17,000 in 1923 ; but between 1933 and 1936 it covered an average acreage of 375,000 and in 1944 this had risen to 431,000. Practically the whole crop is grown in England, where the decline in roots for feeding has accordingly been most rapid.

British farmers have not only controlled their soil and their crops, but have also adapted their live-stock to the needs of modern agriculture. They have produced new breeds, so as to achieve greater returns in a shorter time, to make the animals fit for use at an earlier age, and to suit them to the purposes of the dairy or the slaughter-house. In 1783 Charles Colling, who owned three farms in the Tees valley, popularised the Shorthorn breed of cattle as a meat and milk animal and introduced it later throughout the Midlands. The Hereford breed, which is reared for its meat, was first bred by B. Tompkins about 1760. Then the Devon breed, whose cows are excellent milchers, was produced on the Duke of Bedford's estates. Similar methods of breeding have given rise to various breeds of sheep, e.g., the Dishleys, large, heavy animals yielding a great deal of meat ; the Lincolns, which have a thick fleece ; and the Southdowns and Cheviots. As these English breeds have been widely introduced into the new countries and have been supplied to stock-owners all over the world, they are now to be found in every country.

In British farming everything is regulated the better to adapt the crops and the live-stock to the demands of the market and to make each producing unit yield its maximum. Wheat, barley, and oats give a higher return in Britain than anywhere else. Whilst in France an acre yields on the average 20 bushels of wheat, 22 bushels of barley, and 27 bushels of oats, in the United Kingdom the yields are respectively 31, 33, and 39 bushels to the acre. The density of the cattle population is one-third greater in the United Kingdom than in France, and that of sheep twice as great. Cultivation has diminished, certainly ; but farming is more methodical and

for a given area of surface is one of the most profitable sources of income in the country.

DEPENDENCE ON IMPORTS. The decay of agriculture consequent on the rise of industry destroyed the balance between the production of food and the needs of the population. As a result, Britain depends for her food largely on countries overseas. This situation, in which trade is forced to make up the deficiencies of the soil, was experienced in former times by Athens, Rome, and Venice, and is of frequent occurrence to-day among industrial nations. Part of the bread eaten in England one day is at sea a few days before. During the 18th and at the beginning of the 19th century the problem of food supply was solved by the introduction of intensive methods of cultivation. But soon the country's own resources were no longer adequate. Between 1841 and 1854 the wheat crop was sufficient to feed 24 million people, but to-day it can only feed some twelve million. In 1936, the imports of foodstuffs into the United Kingdom per head of the population amounted to 234 lbs. of wheat, 170 lbs. of maize, 20 lbs. of flour, 67 lbs. of meat, 28 lbs. of butter and cheese, 104 lbs. of unrefined sugar, 10 lbs. of tea, and 50 lbs. of fruit. Of the chief foodstuffs consumed, 85 per cent. of the meat, 51 per cent. of the cheese and butter, and 45 per cent. of the eggs and poultry were imported. Consequently, it was a vital necessity for Britain to exchange her manufactured goods for food; and supplies came to her from all over the world. Meat was imported from the United States, Canada, India, the Argentine, and Australia; and butter from Denmark, New Zealand, Australia, Russia, and the Argentine. Every climate contributed to her fruit supply: oranges were imported from Spain, Italy, the Canary Islands, Jamaica, and Florida; bananas from Jamaica and the Canaries; plums from France, Belgium, the Netherlands, and California; pears from France and California; and cherries from France. Sugar came from the Continent and, especially after the war of 1914-18, from Cuba, Java, and the West Indies. Britain drew her food supply from every part of the world. She cannot exist without trade, and her material prosperity depends on her merchant navy. These economic conditions are responsible for the fundamental characteristics of British commerce, viz. the importance of foodstuffs and raw materials among the imports and of manufactured goods among the exports.

But the German War of 1939-45 caused important changes. Owing to shipping difficulties and to the decline in both visible and invisible exports, the amount of food imported had to be cut down. This was done partly by increasing the quantity grown at home and partly by introducing a rationing system which reduced the amount

of essential foodstuffs available to each individual. Hence in 1946 the imports of foodstuffs into the United Kingdom per head of the population amounted to 153 lbs. of wheat, 46 lbs. of maize, 25 lbs. of flour, 60 lbs. of meat, 9·7 lbs. of butter, 68·5 lbs. of unrefined sugar, 7 lbs. of tea, and 87 lbs. of fruit.

Main Features of the Trade of the United Kingdom, 1938 and 1946

	Foodstuffs		Raw Materials		Manufactured Goods	
	1938	1946	1938	1946	1938	1946
Imports . .	47%	50%	27%	30%	26%	20%
Exports . .	8%	7%	13%	4%	79%	86%

THE RURAL SYSTEM. In the course of three centuries during which rural society has been dominated by a growing commercial and industrial civilisation, three classes have gradually evolved. First, there is the landowner ; then the farmer, who furnishes the working capital ; and lastly, the farm labourer, who does the manual work. This is the principle of the division of labour applied to agriculture. The system of landownership in Great Britain has arisen from the tendency among rich industrialists and merchants to buy country estates, a practice which has caused the absorption of small-holdings. In no Continental country is the land owned by so few people. Some of the estates are larger than the average French *département*, and in Derbyshire the Duke of Devonshire owns nearly 200,000 acres. In Scotland the estates of the Duke of Sutherland are of even greater extent.

But British landlords have often played a leading part in agricultural progress, and many of the great improvements of the 18th century were due to the noblemen through whose influence farming was raised to the dignity of a liberal profession. In our own times many landowners still dwell on their estates and often set their farmers an example of progressive agriculture. Between 1870 and 1900, however, they suffered severely from agricultural crises ; and they would have suffered even more but for the fact that they were able to set off against the losses on their estates the income derived from capital invested in various parts of the world and from the unearned increment on land owned in the towns. On the other hand, economic difficulties due to the vast increase in taxation have ruined many landowners and forced them to sell out their estates. In England these and other social causes have led to the break-up of the great aristocratic estates and to the conversion of their mansions into institutions of various kinds.

Whilst the landlord supplies the land, the farmer furnishes the working capital ; and in this way there is a real division of labour between the two. In France a man is often both landowner and cultivator ; but the British system usually separates the two functions. Before the war of 1914-18 eighty-five out of every hundred farms and eighty-eight out of every hundred acres in Great Britain were held by large landowners. The great acreage of the farms is still one of the distinctive features of the British Isles, though the size of the holdings is declining. More than 20 per cent of the land cultivated in England is occupied by farms containing 100 acres or more, but only 3 per cent. by those exceeding 300 acres. In 1944, there were in Great Britain 362,926 holdings exceeding one acre, of which 224,928 were of less than 50 acres, 125,735 between 50 and 300 acres, and 12,263 of more than 300 acres.

The typical French farm in which the owner is also the cultivator is rare in Great Britain, as is also the French type of farmer, who remains a peasant in manners and ideas, wears humble clothes, cares little for comfort, and is suspicious of progressive methods. The larger British farmer is a business man who invests his capital, runs his farm on a commercial basis, aims at a systematic increase in production, superintends the sale of produce, and attends meetings and shows. He looks beyond his local horizon, has nothing petty in his life, and enjoys the pleasures of a full life and of a comfortable home. His house is spacious and tastefully furnished. It has a flower garden and shrubbery and is placed out of sight of the dung-heaps and outhouses. The farmer does not spend his whole time bending over the soil, but engages in various forms of sport, especially in hunting and shooting. His wife is a woman of the world who knows how to receive her guests and entertain them. She does not associate with her maids, nor does she do the laundry or milk the cows. The British farmer's interests attach him to the sphere of agriculture, but he refuses to be confined within that sphere. In fact, he is the product of a commercial civilisation, who, by putting his hand to its best use, has raised his own status above that of the mere field labourer. Rough, countryfied farmers are only to be found in certain isolated parts of the island.

The social evolution has perhaps left its deepest mark on the labourer. The establishment of the factory system and the rise of industry have gradually emptied the countryside of its labour. In Great Britain the number of farm hands fell from 1,500,000 to 600,000 between 1850 and 1910 ; and between 1923 and 1939 the number of regular and casual workers declined from 892,000 to 803,000. Throughout the kingdom farmers were complaining of the scarcity of labour; and but for the assistance of machinery

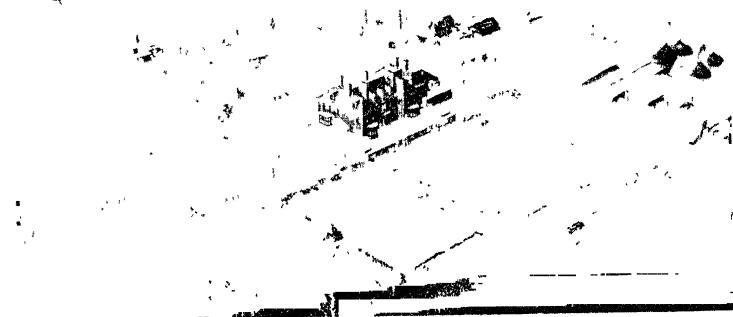
cultivation would be impossible. In some cases dairy farms have been closed down for want of labour to milk the cows. The farmers in certain counties are obliged to call in workers from outside ; and gangs of indigent Irish peasants from Connaught are imported into Britain every year in February or March to supply the necessary labour on the large-scale farms in East Anglia, the Midlands, Northumberland, and eastern Scotland, where they remain until October or November. Sometimes the labour is recruited from the overcrowded towns. Year after year large numbers of the poorer folk from the slums of London and other large towns are engaged to mow hay in the grazing counties on the Welsh Marches or to pick hops in Kent. The scarcity of labour explains why the agricultural labourers who remain enjoy a position far superior to that of their fellows on the Continent. English farm hands do not sleep in a corner of the stable, but live near the farms in trim cottages which have a little vegetable garden and a bed or two of flowers attached to them. Their food is as good as that of the industrial worker, and, as their wages are sufficient for the upkeep of their families, their wives are able to stay at home and look after the house. Hence, in England women were seldom to be seen working in the fields before 1939. But experience in the Women's Land Army between 1939-45 has led to a large increase in the employment of female labour in the post-war years.

Many British economists condemn the social system which prevails in the countryside and would like to revive the class of little cultivator which was once numerous, but is now largely confined to a few districts in Devon, Cumberland, Westmorland, and Lincolnshire. They believe in the truth of Arthur Young's saying that the magic of property turns sand into gold, and would like to create a large class of smallholders. Between 1887 and 1908 a series of Acts passed with the object of enabling smallholders to own their land authorised county councils to rent or buy up large estates, cut them up into smallholdings, and sell them to working owners on a system of easy payments. The experiment seems to have succeeded, especially in certain counties like Worcestershire and Cambridgeshire, and by 1920 the number of smallholdings thus formed already exceeded 15,000. In 1931, something like a third of the cultivators owned the land they worked. The future will decide whether the creation of a new social class will be effected by wise administration of good laws or whether the same result will come about through further economic evolution. The fall in prices of farm produce during the post-war slump put the new owners in a difficult position. Most of them had run into debt in order to buy their holdings, and, as the payments on their mortgages

remained whilst their incomes fell, they found great difficulty in continuing to meet their dues. The Government came to their assistance and, by the Agricultural Credits Act of 1928, established an Agricultural Mortgage Corporation.

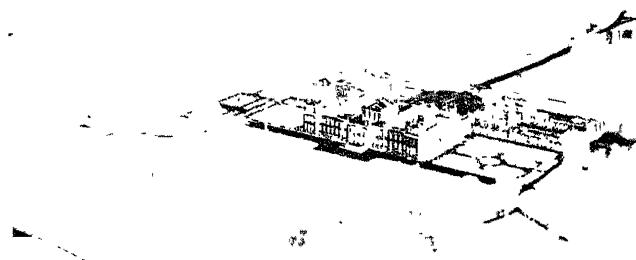
In contrast with Great Britain, where the system of large estates still continues, Ireland seems to be tending towards a *régime* of peasant proprietorship.

RECENT TENDENCIES. The general fall in prices throughout the world has made it increasingly difficult for home produce to compete in the British market with goods from abroad. The arable land in the United Kingdom decreased from 15,709,000 acres in 1923 to 12,906 acres in 1939. Wheat covered only 1,250,000 acres, having fallen off by 30 per cent. in eight years. As another exodus of labourers towards the towns seemed impossible, since the latter were already sorely hit by unemployment, the British Government was forced to intervene. The Agricultural Marketing Act of 1931 authorised the Ministry of Agriculture to organise the various branches of agricultural production by creating Marketing Boards with full powers to regulate the sale of certain produce according to a plan drawn up in advance; and these boards began to organise the marketing of milk, bacon and ham and potatoes. Sugar and fat stock have also been regulated by statute. This organisation has permitted the prices of agricultural produce to be raised, for the Import Duties Act of 1932 gave the Government authority to impose a tariff which would protect the home producer. In consequence, the Marketing Boards were able to control the British market. Thus, Great Britain has given up the economic policy which came into force with the Corn Laws in 1846 and has entered the paths of protectionism. But the new measure was cautiously introduced, for the country cannot escape a strict dependence on overseas trade for its food supply; and, whilst Parliament aimed at shielding agriculture at home from ruinous competition abroad, it also attempted to safeguard the interests of the consumers as far as possible. As home supplies furnished only 13 per cent. of the wheat required by the nation, the Wheat Act of 1932 raised the price of home-grown wheat, but at the same time forbade the raising of the price of the imported article. Consequently, the English consumer buys a portion of his bread at a price which is sufficiently remunerative for the English farmer, and another portion—by far the greater—at the far lower price ruling in world markets. This policy led to a 50 per cent. increase in the acreage of wheat land between 1931 and 1935; and in 1936 the area devoted to wheat amounted to 1,805,000 acres. The increase was achieved to some extent at the expense of the area under barley, and the rapid response to the measure is not



[Photo: Central Aerophoto.

A. A COUNTRY HOUSE NEAR STOCKPORT, CHESHIRE
The house stands in its gardens. Near by are the home farm and the common.

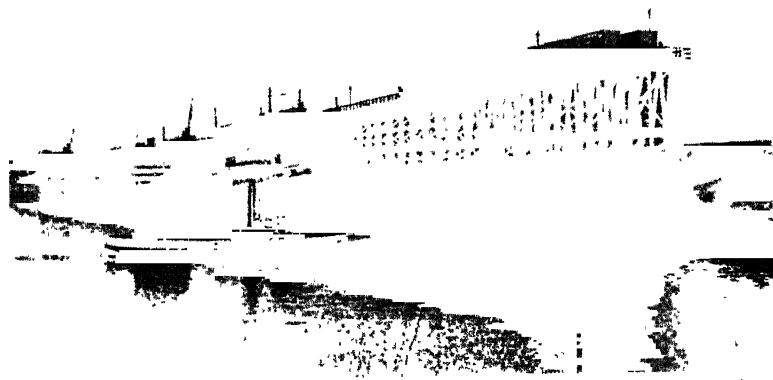


[Photo: Aerofilms.

B. BLENHEIM PALACE, NEAR WOODSTOCK, OXFORDSHIRE
This splendid mansion, the seat of the Duke of Marlborough, received its name after the famous victory of the great duke in 1704.

[To face page 352.

PLATE LIV



[Photo: M. N. R. Jackson]

A. COAL STAITHES ON THE TYNE NEAR NEWCASTLE.



[Photo: M. N. R. Jackson]

B. BLAST FURNACES AT WORK IN THE NORTHEAST.

a safe indication of a recovery in agriculture, for other crops do not show a similar tendency to increase. Since 1931 the area under corn crops has as whole remained constant at a figure of about 5,600,000 acres. The total area of land under cultivation in the United Kingdom in 1936 was less than that in 1930, though the latter year showed a decrease on the years immediately preceding. The area under crops and grass steadily declined every year from 1923 to 1939. It seemed, therefore, that the efforts of the Government to protect and regulate agricultural production would only end in stabilising agriculture in its existing state and in the country's remaining faithful to its specialisation on industry and commerce. But between 1939 and 1945 war needs caused an agricultural revival, and conditions in the post-war world bid fair to force the United Kingdom to grow a larger proportion of its food than was previously done.

The arable area rose between 1939 and 1944 from 12,300,000 to 19,300,000 acres, at the expense of permanent grass. The biggest increases were in the Midlands and West. Very large acreages were planted to the chief foods and fodder crops—cereals, potatoes and roots—and wider use was made of the system of alternating crops and rotation grasses. The expansion of production was made possible only by the far greater use of machinery, since the supply of labour, though greater than in 1939, was not enough to meet the new demands. The number of tractors in agriculture rose from about 60,000 in 1939 to over 170,000 in 1944. Combine harvesters began to be used in increasing numbers. In addition, a good deal of upkeep which had been neglected during the years of depression between the two wars has been made good. Much of this improvement has been due to the work of the County War Agricultural Executive Committees, composed of practical agriculturalists, which have been so effective that they are to be a permanent part of the future British system. The Agricultural Act of 1947, which makes them permanent also establishes a system of guaranteed prices and markets for the principal farm products with the aim of giving stability to the industry: the Act also contains measures to ensure that land is managed and farmed efficiently.

2. INDUSTRY

COAL. Britain's abundant coal supply won her the leading position in industry from the middle of the 18th century and caused her to be the first country in the world to enter the age of steel and machinery.

The part played by coal in the British economic system was due to the distribution of the coalfields (see Fig. 74) and the nature of

the seams. Known coalfields extend under 12 per cent. of the surface of England and Wales and under 5 per cent. of that of Scotland, a percentage greater than that of any other country. Moreover, every single region in Britain contains a coalfield, and the only place which could once complain of its distance from some source of coal was London, which now has shafts being sunk nearly at its gates in Kent. The coalfields, which are never more than fifty miles apart, are arranged in six main groups : the Scottish, which produces 12 per cent. of the British output ; the Northeastern, which produces 18 per cent. ; the Yorkshire, Notts, and Derby, which produces 36 per cent. ; the Lancashire, which produces 6 per cent. ; the Midland, producing 10 per cent. ; and the South Wales, producing 11 per cent. The Bristol and Cumberland coalfields are of less importance. Since 1918 the South Wales and Lancashire areas have diminished in importance, whilst those in the Midlands, Yorkshire, and Nottinghamshire have increased. The little coalfield in Kent, which in 1923 produced only 488,000 tons, increased its output to more than 2 million tons by 1935, but in 1946 its production had fallen to 1·3 million tons. In all the coalfields, except that in Kent, the coal outcrops over wide areas, and it was through the ease with which the coal could be reached that the working of the mines in modern times took place earlier in Britain than on the Continent. This in its turn gave Britain a start in the Industrial Revolution. It has been said that Englishmen who wanted coal had merely to take a pick and dig in their gardens. Furthermore, most of the workable seams are thick, occur in great number, and are arranged fairly regularly and with fewer faults and folds than in Belgium or France. Consequently, machinery is being increasingly employed to dig out the mineral.

The use of coal for domestic purposes began as early as the 13th century. The practice of burning it in household grates, which became general in the 18th century, is one of the most striking features of British home life to-day. The bright log fire and the pile of wood heaped up near the cottage on the approach of winter are things which largely disappeared ages ago with the forests. Even before the invention of the steam engine, large supplies of coal were used by many industries, such as glass works, breweries, distilleries, refineries, forges, dye-works, brick works, lime kilns, and brine pits. As soon as the steam engine and the blast furnace came into use, the consumption of coal became enormous, and mining increased to meet the demand. The output of coal at the beginning of the 20th century reached a figure unequalled in any other part of the world, although it has fallen off in recent years. Here is the annual British output at various periods in thousands of tons :—

British Production of Coal

1660	.	2150	1850	.	56,000	1915-19	.	243,000
1700	.	2610	1865-70	.	102,000	1920-24	.	225,000
1750	.	4770	1890-99	.	191,000	1936-40	.	232,000
1800	.	10,000	1910-14	.	270,000	1946	.	190,000

How much coal remains in the earth after the removal of these vast quantities is a disturbing question which has been examined by several geological surveys. According to their reports, the British reserves of coal situated at less than 4000 feet below the surface are estimated at 140,000 million tons. This means that with an annual output of 230 million tons, the beds examined will be exhausted in 600 years. This prospect, though distant, is already showing clear symptoms of its approach, for there are signs of exhaustion in several of the mines in the Midlands, Lancashire, and Cumberland. Besides, the outcrop coal has been worked out, and the mining has reached depths which are becoming both inconvenient and expensive. The average depth of the shafts scarcely exceeds 900 to 1200 feet, but some go down to 1650 feet in South Wales, 3000 feet in Durham, and to even greater depths in Lancashire. The approaching exhaustion is also reflected in the decreasing output per miner, the British miner's being only one-fourth of that of the American; and in the rise in cost of production. Consequently, the increase in yield in British coalfields has not been able to keep pace with that in American fields. Up to about 1870 Britain produced half the world's total output of coal, but she was caught up about 1900 by the United States. Between 1900 and 1914 the British output was only three-fifths of the American and in 1920 it was two-fifths. Since 1942, open-cast coal production has been carried on, but the damage to agricultural land caused by the process has been considerable. In 1946, 8,820,000 tons of coal were extracted in this way.

Coal is the principal material in coastwise trade. From the 13th century it was shipped from Newcastle to London, when it took its former name of 'sea coal.' In 1670, London imported 355,000, and in 1795 1,120,000 tons. A whole fleet of vessels is employed in the trade. Coal is shipped from forty-three English and fifteen Scottish ports, and is landed at sixty-two English, twenty-three Scottish, and sixteen Irish ports. Such an abundant source of cargoes is possessed by no other country in the world.

But though coal is of great importance in internal trade, in overseas commerce the export of the mineral has been the main source of wealth of the merchant shipping. Most of the raw materials imported into Great Britain to be manufactured are re-exported in the form of goods of far less bulk and weight. Hence, many ships

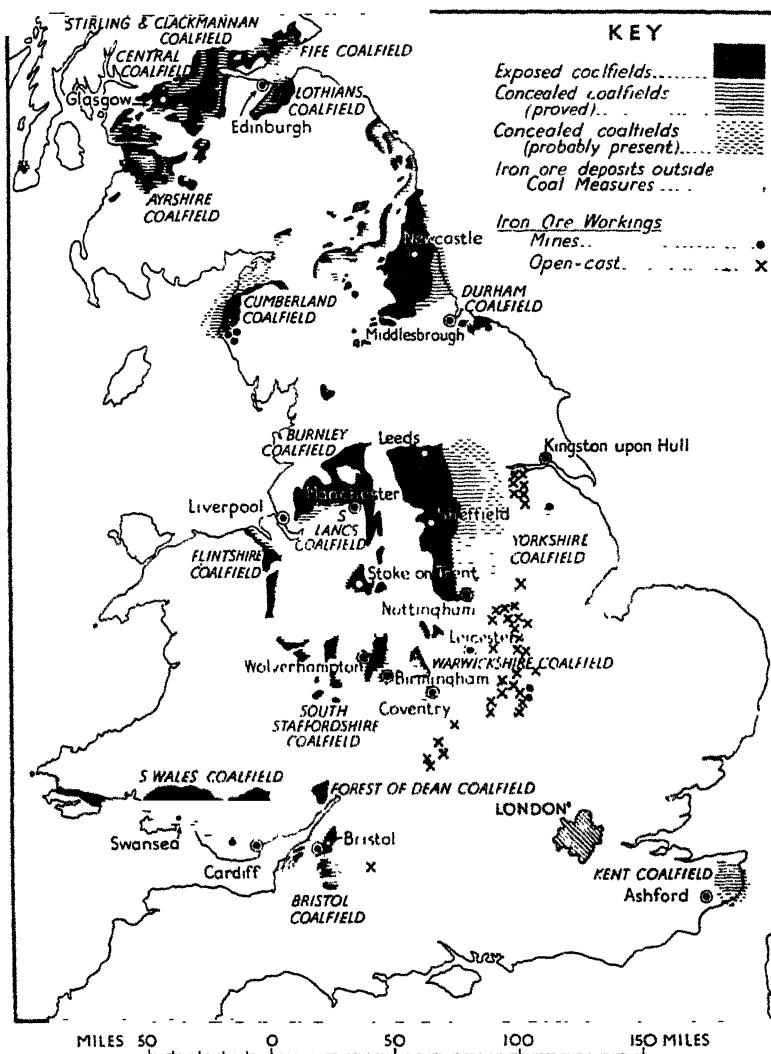


FIG. 74. COALFIELDS IN BRITAIN, 1947.

would sail half-empty but for the complement of coal which supplies return cargo. It is so necessary in modern life that it finds a ready market wherever a civilised people has no supply of its own. Thus, British coal followed the flag into every sea, and exports overseas rose from 3,800,000 tons in 1850 to 76,000,000 in 1913. The figure for the latter year represents nearly one-fourth of the total output

and more than three-fourths of the total weight of British exports.

Up to 1939 coal was exported mainly from four groups of ports: South Wales (Cardiff, Newport, Swansea, etc.), the Northeast (Newcastle, Sunderland, Blyth), the Humber (Hull, Grimsby), and the Scottish ports of Glasgow, Grangemouth, Methil, etc. South Wales headed the table of exports, its share rising from 40 per cent. of the total in 1913 to 43 per cent. between 1927 and 1931. Next came the Northeast with 34 per cent. The chief buyers of British coal were the countries on the Atlantic seaboard of Europe from Norway to Portugal and those in the Mediterranean. These two markets took four-fifths of the total export, France being the largest customer. The Mediterranean coaling stations at Gibraltar, Algiers, Malta, and Egypt imported considerable quantities. But there were more distant customers, like the South American countries, and at the end of the 19th century there were still some in the Indian Ocean, India, Ceylon, Java, and even the Far East.

But since 1900 the export of coal has tended to diminish and the distance to which the mineral is sent to grow shorter. Rivals have sprung up on all sides and have captured some of the trade. British coal competes with American in Central and South America, the Mediterranean, and even Western Europe. Indian, Australian, and Japanese coal has driven it off the seas east of Suez, and South African coal is now shipped as far as Bombay and Aden. The use of new sources of power, such as mineral oil and hydro-electricity, has also helped to lessen the exports from Britain. In 1936, these had fallen to 34,520,000 tons, which was less than one half of the total for 1913 and only 15 per cent. of the total British output. Since the outbreak of war in 1939 the quantity exported has fallen to about one-tenth of this amount, the figure for 1946 rising slightly to 4.5 million tons. The loss of the more distant markets is the most serious feature of the general contraction of the British coal trade, for British shipping loses a valuable return freight for the cargoes of raw material and foodstuffs carried to the British Isles.

IRON. British industry long dominated the world's markets with its manufacture of iron, cotton, and wool. Until coal was used for smelting iron ore, the iron works in Britain were grouped together mainly in three places situated near outcrops of ore and in the midst of forests which supplied fuel. These places were the Forest of Dean, which lies between the Severn and the Wye; the districts round Birmingham and Sheffield; and above all the Weald of Kent. At the beginning of the 18th century the iron industry was incomparably smaller than that of wool both in the amount of goods produced and the extent of its markets. Between 1710 and 1720 England exported scarcely 4000 tons of iron goods, and imported

more than 20,000 tons from Germany, Sweden, and Spain. About the middle of the same century there were fears that the lack of fuel caused by the age-long destruction of the forests might compel the furnaces to shut down and the forges to cease work. The use of coal, however, caused a revival and started what may be called the reign of iron. Works sprang up on the coalfields, and by the beginning of the 19th century South Wales and Staffordshire (Birmingham) alone were producing more than three-fourths of the total British output. In our own times the iron industry is still closely associated with coal, though the ore has to be brought from afar. The districts in which the industry is now carried on may be grouped together according as they are on the coast or right inland (see Fig. 76).

The inland groups lie round the southern foot of the Pennines on the Yorkshire, Lancashire, and Midland coalfields. The Industrial Revolution first came upon the iron industry in the Black Country, where the circumstances were all favourable, viz. long experience and tradition, the presence of ore, and an abundance of coal. But economic conditions have changed, and local ore has long been insufficient, whilst the distance from the sea adds expense to the transport of ore from the coast. Consequently, the inland works have given up the production of crude material like pig iron and even half-finished goods, such as large pieces of ordinary steel, and are turning more and more to articles which need more workmanship and fetch a higher price. In other words, skill is brought in to compensate for a smaller production. This is the direction things are taking in Birmingham, which makes tubing, pins, fish-hooks, and motor cars ; in Sheffield, which produces cutlery and weapons ; in Bolton, Oldham, and Keighley, which manufacture spinning machines and looms. Some of the firms in Sheffield and Birmingham have had to set up works on the coast at Middlesbrough and Workington, in order to carry on the manufacture of rails, girders, armour-plate, and other heavy goods. With these inland groups which specialise more and more on finished articles must be included the scattered factories which produce farm machinery in the eastern districts at Norwich, Lincoln, Gainsborough, and Grantham, as well as the construction and repair shops set up by the several railway companies at Crewe, Swindon, Eastleigh, Doncaster, Derby, Oswestry, and Glasgow.

Most of the British iron and steel works are placed near the sea. In South Wales the works at Swansea, Llanelli, Cardiff, Newport, Pontypool, and Merthyr Tydfil are situated on a coalfield ; but as the district produces little ore, it makes pig iron from foreign mineral supplies. The Scottish works ranged round Glasgow were

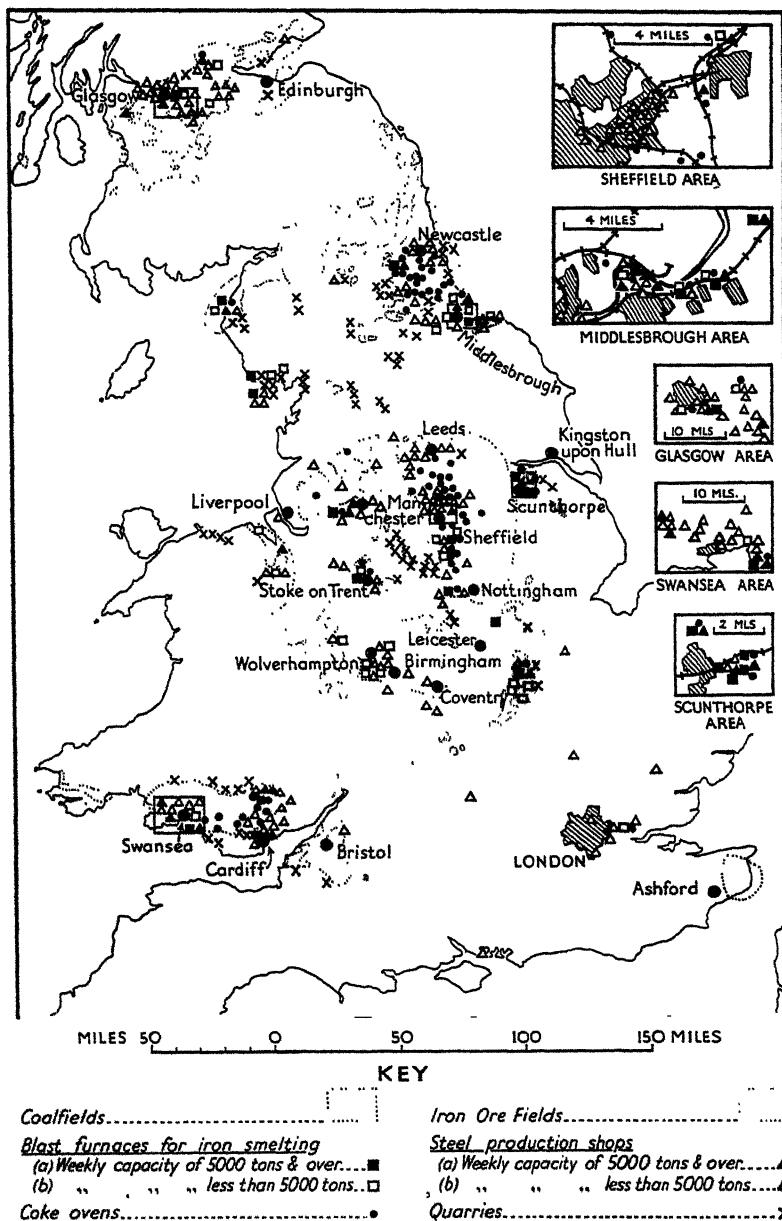


FIG. 75. Blast Furnaces and Steel Works in 1947.

among the first to manufacture on a large scale. The district owed its early prosperity to David Mushet's discovery in 1801 of the famous blackband ore which is closely associated in the local mines with the beds of coal. But the ore is no longer sufficient for the needs of the Scottish works, and nowadays foreign ore is imported up the Clyde. The Scottish industry is distinguished by the wide range of its operations, which include on the one hand the production of pig iron and, on the other, the manufacture of engines and the most delicate machinery. The iron industry developed in the Northeast about the middle of the 19th century, when the ore in the Cleveland oolitic beds began to be worked. It has two centres : one on the ore workings at Middlesbrough, the other on the coalfield at Newcastle. Exchanges of material are easily carried out between the two by a short sea journey from one estuary to the other. Foreign ore is also brought by sea as return cargo in the colliers to be mixed with local supplies.

Shipbuilding, which is one of the main forms of British iron and steel industry, was due to the use of the sea for foreign trade. At the beginning of the 19th century the largest shipyards in the world were in the United States near the vast forests of New England and Pennsylvania. England actually brought ships there. As soon as iron began to be used instead of wood for shipbuilding, Great Britain took the lead. The industry deserted the old seaports, like those on the Thames, which were without coal and iron, and established itself on estuaries which either had the necessary supplies or were placed so as to come by them easily. It is now mainly carried on in three districts. The first is the Northeast on the banks of the Tyne, Wear, and Tees, where supplies are drawn from the enormous metal works at Newcastle and Middlesbrough. Here one-fourth of the tonnage launched in the United Kingdom is constructed. The second district is on the Clyde, where the shipyards, which stretch for twenty-five miles along the estuary, build more than one-third of the British shipping. The third is at Belfast, where there is neither coal nor iron, but whither supplies are easily taken from Scotland and England. British shipyards launched an average of 227,000 tons of shipping annually between 1859 and 1862, 954,000 between 1899 and 1902, 2,038,500 in 1912, 1,085,000 in 1925, 1,030,000 in 1938, and 987,000 in 1946. Of the world's tonnage, they built 80 per cent. in 1880, 62 per cent. in 1901-10, 49 per cent. in 1925, and 38 per cent. in 1936. The decline was increased by the colossal rise of shipbuilding in the United States during 1914-18. But the American increase did not last, and since 1922 Great Britain has resumed the lead. She builds ships not only for herself, but also for the whole world, and other countries depend

on her shipyards both for repairs and for construction, for the kind of work required is certain to be supplied by one of the many specialised yards which turn out various types.

The British iron and steel industry dominated the world market from the end of the 18th century to the last quarter of the 19th century, but it has not maintained its position. It is losing ground partly because it is becoming more and more dependent on foreign ore. Up to 1850 nearly all the ore used came from the coal measures at home, and a great advantage was thereby gained. Now these ores are of little importance, except in Scotland and Staffordshire. The decline in their use is due not to their exhaustion, but to their poor quality, and technical progress may one day bring them back into the foreground. Shortly after the middle of the 19th century Bessemer's invention gave a special value to ores which were poor in phosphorus. The ore in the Furness peninsula began to be worked between 1852 and 1890; but the beds are small, and the more accessible parts are already exhausted. Production has steadily diminished since 1880.

A third and most important source of ore came into use between 1850 and 1860, viz. the beds which occur in the Jurassic rocks running in a wide curve from Cleveland in Yorkshire through the counties of Lincolnshire, Northamptonshire, and Leicestershire as far as Gloucester. They were first worked in the Cleveland district, which is near to both coal and the sea; and they brought prosperity to Middlesbrough. But the mines in the Cleveland district are showing signs of exhaustion, and the more important mining operations have moved south to Lincolnshire, Northamptonshire, and Leicestershire. In 1936, these counties together with Oxfordshire and Rutland yielded 75 per cent. of the British production of ore, whilst in 1913 they supplied only 41 per cent. The Jurassic ores contain a good deal of phosphorus and are only moderately rich in iron content; but they are easily worked by machinery in open quarries, and they furnish eleven-twelfths of the ore raised in Britain.

But even these mines do not supply all the needs of the iron and steel industry, in spite of the enormous reserves which the beds contain, because in the present economic conditions the owners of the works feel that greater profit is derived from smelting the richer ores from abroad than from using exclusively a large mass of poor native ores. In consequence, ore is imported from Spain, Sweden, Algeria, Greece, Newfoundland, Sierra Leone, etc. Since the beginning of the 20th century these imports have formed one-third of the ore used in Great Britain, and consequently, owing to the high metal content of the foreign material, an even greater proportion of the pig iron produced (see Fig. 77). The various

aspects of the supply of iron ore in Great Britain are summed up in the following table :—

Sources of Iron Ore Consumed in Great Britain.

(The figures are in thousands of tons.)

	1850.	1860.	1890.	1910.	1919.	1939.	1946.
Ore from the coal measures	6,500	6,500	2,060	1,700	980	154	6
Jurassic ore from Cleveland, etc.	—	4,070	5,610	6,150	3,710	} 13,364	11,662
Jurassic ore from Lincolnshire, Northants, Leicestershire	—	1,270	3,440	5,500	5,990		
Hematite from Cumberland and Furness.	280	2,100	2,400	1,700	1,210	761	379
Total British production .	—	13,940	13,510	15,050	11,890	14,486	12,173
Imported ore . . .	—	200	4,700	7,200	5,500	6,239	6,001

The exceptional advantages enjoyed by the British iron and steel industry have brought it an amazing prosperity. The production of pig iron rose from 17,350 tons in 1840 to 200,000 tons in 1900, 3,500,000 in 1855–59, 9,375,000 in 1908–12, 7,980,000 in 1939, and 7,761,000 in 1946, one-third being produced round Middlesbrough, one-fifth in the counties of Derby, Leicester, Nottingham, and Northampton, one-seventh in Lincolnshire, one-tenth in the northwest, and also one-tenth in Wales. About 1850 Great Britain produced half the world's iron, and she kept this leading position until 1875. After that date symptoms of decline began to appear owing to foreign competition and to disadvantages arising from internal circumstances. The year 1890 is a milestone in the history of the iron and steel industry, for then it was that production in the United States first exceeded that in Great Britain. In 1929, whilst the United States produced 42,600,000 tons of pig iron, Great Britain produced only 7,600,000 tons. The sceptre has departed to the other side of the Atlantic, never to return. Bad years due to the war of 1914–18 and marked by terrible unemployment have brought about a decline which is merely a passing phase. But the conquest, at any rate in part, of the former British markets by new rivals cannot be temporary. Between 1873 and 1895 the export of iron and steel goods had already fallen off by half and that of hardware by more than half. In the three years from 1909 to 1912 Great Britain's share of the world's exports of metal goods had dropped from 62 to 44 per cent. Orders from countries which were badly equipped industrially passed gradually to the United States, Germany, and elsewhere. The increased price of coke, the diminution in the reserves of ore, and the possession of

works which were often out-of-date caused Great Britain to be outdistanced by some countries and to be closely followed by others. In spite of everything, she still occupies a great position in the industry, for every year she exports to the world as a whole large quantities of pig iron and steel, tin goods, machinery, looms,

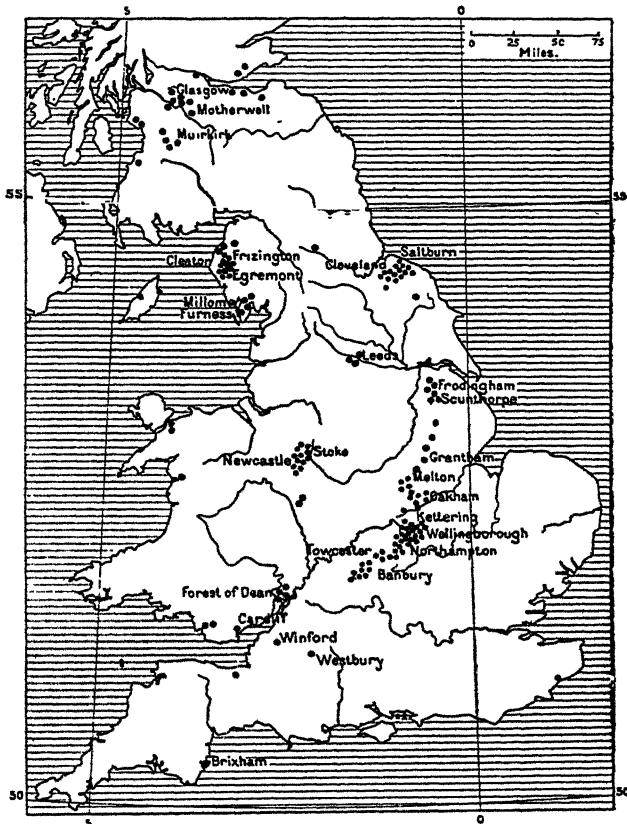


FIG. 76. Iron Workings in Great Britain.

hardware, cutlery, locomotives, motor cars, electrical apparatus, ships, and aircraft. In 1913 and 1922, metal products formed 35 per cent. of the exports of manufactured goods from Great Britain. Between 1913 and 1936 the export of heavy goods fell off by one-half, but the value of telegraphic and telephonic apparatus exported increased ten times, that of electrical appliances was doubled, and new categories of metal goods appeared on the lists of exports. This tendency has continued to strengthen.

WOOL AND COTTON. Great Britain's long experience in the art of weaving caused a warm welcome to be given by the woollen and linen industries to cotton, silk, and jute, when these new fibres were introduced by merchants trading overseas. Jute manufacture is concentrated in Dundee; silk in Derby, Coventry, and Macclesfield; and linen in Belfast. But the cotton and woollen manufactures occupy whole districts, the former being spread over south Lancashire and the latter mainly in the West Riding. The textile industries employ more than 5 million persons, and are responsible for half the value of the imports of raw material as well as half of that of the exports. Cotton and wool are by far the most important, and of these cotton has after a long struggle wrested the lead from wool. At the beginning of the 19th century the production of woollen goods was valued at seventeen times that of cotton, but a hundred years later the value of the cotton goods produced was more than twice as great as that of the woollen goods.

Although at the beginning of the 18th century the woollen industry was scattered about the country, it had three main centres: Norwich in the east, the district between the Bristol and English Channels on the west, and the West Riding on the north. The use of coal and machinery upset this geographical distribution, and today four-fifths of the woollen industry is concentrated in the West Riding. The existence of other woollen centres shows that there is not so high a degree of concentration in this industry as in cotton. Very vigorous little centres still survive in the Tweed Valley, at Kidderminster in the Midlands, and at Wellington (Somerset) and Stroud in the West Country. The woollen industry in Great Britain employed 207,000 persons in 1939, produced more than 400 million square yards of cloth in 1935, and annually consumes more than 300,000 tons of raw wool. British mills have always worked to supply foreign markets. At the end of the 17th century woollen cloth represented two-thirds of the country's exports, and until 1914 half the woollen manufactures were exported. But conditions in the foreign market have changed to the detriment of the British exports. Since 1875 many countries, like France, the United States, Germany, and Italy, have developed their woollen industry, and others, like Japan, Australia, and Canada, have entered the field; and they are all tending to supply their own needs. When the British manufacturer found many doors closed to him, he began to fall back on the export of half-finished goods—combed wool and yarn—of which Germany became the largest buyer; but even this trade threatens to come to an end. The industry seems to have been one of the hardest hit by the war of 1914–18, and in 1935 only one-eighth of the woollen cloth manufactured was exported from

Great Britain. More than any other country she needs a peaceful, industrious world, for her best markets—Japan, Australia, Canada, the United States, the Argentine, China, France, and Germany—lie scattered over the face of the earth. She also depends wholly on overseas countries for her raw material, since nearly four-fifths of the raw wool consumed in her mills comes from Australia, New Zealand, and South Africa.

The Industrial Revolution in Great Britain achieved its greatest success in the cotton industry. Being new and having no traditions from the past, this industry easily took to machinery without a long process of adaptation. Whilst the power-loom, the Spinning Jenny, the water-frame, and the mule—all British inventions—were one after the other applied in cotton manufacture, the woollen industry long remained faithful to old processes. Cotton won its leading position among textiles through the use of machinery. Whilst between 1856 and 1885 the number of cotton mill hands increased by only 32 per cent., the number of spindles rose by 56 per cent. and that of looms by 88 per cent. The production of yarn increased tenfold between 1820 and 1880, whereas the labour employed was merely doubled. The vast importance of machinery caused the cotton industry to be concentrated almost entirely in south Lancashire. The only mills outside this district are in Paisley and Nottingham, and these are all confined to special forms of manufacture. The conquest of the world's markets caused the industry to expand year by year ; and the number of spindles rose from 8,685,000 in 1850 to 56,351,000 in 1920, whilst the consumption of raw cotton mounted from 110,000 tons annually in 1828–31 to 940,000 tons in 1911–13, though it fell to 590,000 tons in 1920–21. So vast a demand for raw material created some anxiety concerning future supplies, for the United States, the greatest exporters of raw cotton, were using an increasing proportion of their production for their own manufactures. Consequently, British manufacturers tried to increase the cultivation of cotton in every suitable part of the Empire : the West Indies, India, and especially Africa. But though the problem of raw material was a vital one for Lancashire, that of markets was even more important, for cotton goods were manufactured in Great Britain for the special purpose of export. Three-fourths of the goods produced were sent abroad, mainly to India, China, Egypt, Turkey, tropical Africa, and the Malay Archipelago. The cotton industry, like all others in Britain, is faced with danger, for it is finding rivals not only in Europe, but also in India, China, Japan, Brazil, and the United States. To keep her leading position, Manchester was obliged first to specialise in goods of fine quality, leaving to her less-experienced rivals the work

of turning out coarser cloth ; then, when her merchants were unable to sell cloth in countries which were now weaving their own cloth, she restricted herself to selling yarn.

Lancashire's first serious rival in the cotton industry lay in the United States, which had at their disposal an enormous production of home-grown raw material. In 1860 there were six spindles in Britain to every one in America ; but by 1927 the proportion was three to one, and the number of looms in the United States exceeds that in Britain. Between 1942 and 1945 there was a great expansion of the cotton industry for war purposes in the United States. English cotton goods are being bought less and less in the United States and in markets which have come under American control. After 1918 other markets became closed to British goods, and, what was even more serious, the industrialisation of the vast populations of the Far East, where the standard of life was low, caused extremely formidable competition as soon as Japan, India, and China, Lancashire's chief customers, began to manufacture cotton goods with up-to-date machinery and very cheap labour. A bale of cotton can be spun in Japan at 40 per cent. of the British cost, and, consequently, Japanese manufactures captured from Britain a large number of customers in South America and in countries bordering on the Pacific and Indian Oceans. Furthermore, since the war of 1914-18 the Russian market has been closed. In recent years cotton has had to face increasing competition from synthetic fibres, especially rayon and nylon. Many cotton firms are turning over to these new fabrics. The annual consumption of raw cotton had fallen to 363,000 tons by 1946.

The exports of cotton from the United Kingdom, which had risen to 7000 million square yards in 1913, decreased to 1449 millions in 1938, and 513 millions in 1946. Japan's export of cotton piece goods, which in 1935 amounted to 2710 million square yards, exceeded that of the United Kingdom in 1933. Hence, in Britain the cotton industry suffered a terrible state of unemployment. In 1934 one-fourth of the mill hands were out of work. Between 1913 and 1934 the quantity of raw cotton consumed decreased by 42 per cent. In order to face the competition, especially that of Japan, Lancashire tried to rationalise production and to specialise in the manufacture of cloth of high quality or new design, a work which demands a technical skill acquired only after long experience in industry. The problem of the cotton industry is a vital one for Britain, for, besides being the chief pillar on which her commercial expansion and her financial power were raised, cotton is one of the essential cogs in the colossal industrial machine created for world trade. Though vast, this machine is delicate and may be thrown out

of gear by every political or economic disturbance that occurs in any part of the world.

ADAPTATION TO NEW ECONOMIC CONDITIONS. Thus, the chief British industries have all been profoundly affected by the competition of industrial countries which have recently sprung up in almost every part of the world. These rivals have the advantage of newer and therefore more up-to-date machinery, of a stronger organisation, and often of cheaper labour. To maintain her position in world trade and to retain her markets, Great Britain has had to adapt herself to new economic conditions. The process of adaptation was not immediate, and the crisis in industry showed itself between the wars in a terrible state of chronic unemployment. The number of persons unemployed between the wars varied between one and three million annually. But after having reached its lowest point during the crisis of 1932, British industry seemed to be on the way to recovery owing to its strenuous efforts to adapt itself to changing conditions. It had modernised its machinery and renovated the equipment of its mines, its metal shops, and textile factories. But the older industries were not able to catch up the lead which the newer ones had in these respects. The cotton industry, for instance, still remained largely faithful to the spinning mule and had relatively few ring spindles, though these yielded an increased production at a lower rate of cost.

The organisation of industry had also to be overhauled, and, breaking away from the old traditional individualism, British industrialists adopted the methods of vertical and horizontal integration. In many cases firms engaged in the same industry have entered into amalgamations, of which the British Iron and Steel Federation and the Lancashire Cotton Corporation are examples in the metal and cotton industries respectively, whilst the field covered by Imperial Chemical Industries, Ltd., goes far beyond the British Isles. Though England is still far from possessing organisations comparable with the American, and the pre-war German and Japanese combines, yet the co-ordination of the various industries is increasing. The Government helped before the war by drawing up plans for rationalising some of the more depressed industries. Thus, in 1936 it adopted a scheme involving the destruction of 10 million idle spindles and the refitting of many old mills. The slowly progressive nationalisation of main industries, which began with the establishment of the Port of London Authority, the London Passenger Transport Board and the Central Electricity Board, has been hastened since 1945; and now coal-mining is under the authority of the National Coal Board, the railway system has been taken over by the State, the gas industry is nationalised, and there are plans

for nationalising road transport and the iron and steel industries.

Besides industrial rationalisation, a more far-reaching development due to the new needs of the international market has taken place since the war of 1914-18. Whilst some of the old industries have been decaying, new ones have been springing up and developing at a surprising rate. Between 1923 and 1937 the number of employees in coal mining has decreased by 28 per cent., in iron ore mining by 44 per cent., in pig iron manufacture by 40 per cent., in steel manufacture by 9 per cent., in cotton manufacture by 27 per cent., in jute manufacture by 25 per cent., and in shipbuilding by 36 per cent. Since 1945, except in the manufacture of pig iron, in which the figures show little change, or in shipbuilding, in which there has been a great increase in employment, these tendencies still continue. But there has also been a tendency to large increases in the numbers engaged in printing and publishing, in electrical engineering, and in the manufacture of heating and ventilating plant, electric cables, apparatus, and lamps, rubber and plastic goods, scientific and photographic apparatus, paper, and typewriters. Transport, commerce, banking, hotel-keeping, glass-making, the distributive trades, and the chemical industries have added to the number of employees. In the declining industries there were before 1939 large numbers of unemployed : in 1937 coal mining accounted for 17 per cent., the heavy metal industries for 11 per cent., shipbuilding for 22 per cent., cotton for 11 per cent., and jute for 21 per cent. ; whilst in the developing industries as a whole unemployment was as low as 10 per cent., and in many particular cases it was less than 5 per cent.

The staple industries of the British economic structure—coal, heavy metal production, shipbuilding, and cotton—were among those declining and the decline continues. Owing to the volume of production and the large numbers employed, they are still the most important, but the trend of development is at present unfavourable to them. They are gradually being ousted by industries which use new kinds of raw material or which mass-produce high-grade manufactured goods, the demand for which increases with the standard of life and culture of the nations of the world. Thus, the textile mills are largely turning over to rayon and nylon, and plastic material is making its way into all manufacturing industries. Great Britain specialises in the higher types of manufacture ; and thus an evolution similar to that in the Black Country is taking place in the country as a whole.

Whilst the whole structure of British industry is changing, a modification of its geographical distribution is also in progress. Properly speaking, there is no real migration of industries ; but

whilst certain centres are declining, others are expanding more or less rapidly elsewhere. Between the wars, unemployment was far greater in the 'distressed areas,' and those out of work found employment more slowly than elsewhere. Southwestern Scotland, South Wales, the Northeast of England, and Lancashire, where the decaying industries were concentrated, were naturally the hardest hit. In 1931, these five areas contained 35 per cent. of the industrial population of Great Britain and 45 per cent. of its unemployed. The Census of 1931 showed that the English counties most affected by unemployment were in the North. The southeastern counties were the least affected. A line drawn approximately from Bristol to Hull would have nearly all the areas with a high degree of unemployment on the north and those with a low degree on the south. In contrast with the distressed areas, new industrial centres developed in Northamptonshire, at Coventry, Oxford, and, more especially, round London. The economic and industrial part played by the metropolis continues to grow. The city is constantly spreading its tentacles over the counties nearby and is industrialising the whole of southeastern England. The development of industry in this region is a characteristic feature of the modern British economic structure, and has resulted in new tendencies in production. Industry is slowly deserting the coalfields for the great cities and their skilled labour. The influence of the great ocean routes converging on the Channel and the Straits of Dover no doubt also affects the problem. But the Government is taking steps to spread industry and population more evenly, either by building new towns, such as Stevenage or Crawley, to relieve overcrowded cities, or by establishing large trading estates, like that at Aycliffe in County Durham.

Thus, after the terrible depression of 1931-32, British industry made a vigorous recovery. Unemployment diminished, the number of blast-furnaces at work increased from sixty in 1932 to 130 at the beginning of 1938, and the shipyards were resuming their activity. Much of the recovery since 1936 was due to the great rearmament programme; and it must not be forgotten that the country's vast industry still suffers from a deep-seated trouble, though this has been concealed by events connected with the war. The solution of the whole problem lies in adaptation to modern conditions by bringing equipment and organisation up-to-date, and by specialisation in the more complex forms of manufacture, the production of high-grade goods in which long experience secures undeniable advantages, and the use of new materials and processes.

3. TRANSPORT

The development of the means of transport in Great Britain has gone hand in hand with the development of industry, and the

means of communication have been established according to the needs of the economic system. At the end of the 18th century, in spite of the improvements brought about by Telford and Macadam, the roads in England, as in most of even the progressive countries of Europe, were still in a bad condition. Even over short distances regular transport of goods by wheeled vehicles was impossible owing to the muddy state of the highways, and most of the wool and cloth from Yorkshire was carried on pack-horses. 'The merchants of Leeds,' says Duchesne, 'went from market to market with troops of pack-horses in order to buy and sell cloth, and they travelled in summer only, on account of the poor state of the roads in winter.' The main highways were better kept than the local roads, but they no longer sufficed for the transport of the vastly increased quantities of raw materials, manufactured goods, and foodstuffs; and in winter they could not ensure a regular supply of food and coal to the towns. Transport by river scarcely eased the traffic on the roads, for, except in the tidal estuaries, the country is too small to permit the formation of streams of sufficient depth to accommodate large boats. The Thames and the Severn, for instance, have a volume of one one-fifth of that of the Seine.

CANALS. The problem of cheap transport of goods in England was solved for a time in 1770-92 by the construction of a network of canals. The first canal in the country was the Bridgwater, which was constructed between 1759 and 1761 by James Brindley to transport coal from the Duke of Bridgwater's mines at Worsley near Manchester. It halved the cost of transport and started a wave of enthusiasm for canals. The industrial districts were promptly criss-crossed with new waterways communicating with one another, and nearly the whole of the present system was created at this time. Between 1766 and 1777 the Grand Trunk Canal, a colossal undertaking for the period on account of its length of 93 miles and its five tunnels, was constructed to connect the North and Irish Seas through the Trent and Mersey. Others were constructed from Yorkshire across the Pennines to Lancashire, from the Thames to the Severn, and from Birmingham to the estuaries of the Mersey, Severn, and Thames. Local systems were formed round Birmingham and over the whole of south Lancashire.

But after the middle of the 19th century this means of inland navigation ceased to expand. It is astonishing how little canals and rivers are used for transporting heavy material over great distances in this coal- and iron-producing country. All the coal which reaches London goes by sea or rail, and the Great Western Railway alone carried more goods than all the inland waterways together. The greatest obstacle to the use of canals has been the

penetration of the sea into the land all round the coast. As the estuaries run towards each other, no manufacturing town is more than 80 miles from a tidal port. That is why communication between the different parts of the country was formerly carried on mainly by sea. Transport by canal was too slow and was handicapped by the large number of locks, the lack of water in times of drought, the absence of standardisation in the dimensions of locks and of the canals themselves and the consequent many transhipments, and the arbitrary and irregular tariffs imposed. It should be added that the railway companies strangled the canals by buying them and directing traffic away from them. Hence, inland navigation in Great Britain has always been characterised by the smallness of its long-distance traffic and the predominance of local traffic which never moves from one canal to another. On the Grand Junction Canal most of the traffic occurs near London. On the Leeds and Liverpool Canal none of the traffic crosses from one side of the Pennines to the other, movement being confined to the coalfields on either side. In the Midlands there is no traffic on the canals, except near Birmingham. Consequently, from the beginning of the 19th century the industrial world felt the need for a radical change in the means of transport, and this was effected by the railway.

THE RAILWAY SYSTEM. The first railways, like the first canals, were constructed for the transport of coal. As early as the 17th century coal trucks had been drawn on wooden rails from the pithead to the riverside in the Newcastle district. At the beginning of the 18th century iron rails were substituted for wooden ones, and by the beginning of the 19th century the device began to be used outside the coalfields for the carriage of all sorts of heavy goods. A revolution took place when the draught horse was replaced by the steam engine. The first locomotive to draw trucks over lines was used in 1804 at Merthyr Tydfil on the South Wales coalfield. The first steam railway ran between Stockton and Darlington, a distance of 19 miles. Its locomotives were built by Stephenson.

At first the only freight was coal, and no other goods were carried by rail. But the increasing weight and volume of industrial material which has to be moved in various parts of the country demanded a new means of transport. Industrialists were groaning under the slowness of communications and the high charges imposed by canal owners. Bales of cotton which crossed from America in twenty-one days took a month and a half to travel from Liverpool to Manchester. So, business men who had keenly followed the early success of the locomotive urged the construction in 1824 of a railway between the two towns, and the 28-mile line was opened on September 15th,

1830. Its success was immediate and enormous, since its speed was twice as great as that of the fastest coaches and the cost of the transport of goods one-third of that of the other means of transport then existing.

A railway fever promptly swept over the country. In 1850 the United Kingdom possessed 6339 miles of line at a time when there were only 1927 miles in France. The British mileage increased to 18,000 in 1880, 23,500 in 1910, and 37,000 in 1937. There are 20 miles of track to every 100 square miles of surface, a density second only to that of Belgium, where there are 40 miles of line to every 100 square miles of surface. The English railway system differs from most of those on the Continent in not being faced with the competition of water transport and in being the normal means of inland transport. Whilst in 1921 the inland waterways transported 12 million tons of goods, the railways carried 324 million tons in 1920, an overwhelming difference.

The association of railways and shipping companies is a feature of the British system. Large railway yards at the head of the tide at Ipswich, Colchester, London, Southampton, Exeter, Plymouth, etc. form the connecting links between the two means of transport. In Ireland nearly all the important towns—Cork, Waterford, Dublin, Dundalk, Belfast, Londonderry—also illustrate this connexion of ship and rail. The railway yards in the seaports were admirably equipped by their companies to accelerate the handling of goods. At Lowestoft, Hull, and Grimsby this equipment deals with fish ; at Harwich, Dover, Folkestone, Newhaven, Southampton, and Holyhead with passenger traffic.

The great importance of the metropolis is shown in England no less than in France by the lay-out of the railways. The main lines all converge on the city, and the fast trains all start or end their runs in it. Within moderate distances of London or Paris the quickest journey between two towns, even though they may be fairly close together, is made by travelling into the city and out again. Along the main lines which radiate from London to the distant parts of the country every effort has been made to shorten the time taken. Great Britain boasts a number of engineering feats which shorten the connexion between the heart of the country and outlying parts. The old L.N.E.R. line from London to Aberdeen avoids the *détour* round the estuaries at Stirling and Perth and goes straight across the Forth and Tay on two remarkable bridges. The Forth Bridge (see Plate LVa), built in 1882-89, has a length of 5330 feet—with approaches, 8295 feet ; the Tay Bridge, which has a length of two miles 73 yards, was opened in 1887 to replace that destroyed by a gale on December 28th, 1879. Similarly, the Severn

Tunnel, with a length of 4 miles 624 yards, was completed in 1886 to shorten the journey from London to Cardiff and Swansea. Express trains connect the metropolis with the remotest ends of the islands, and it is possible to travel from London to Limerick in less than twenty-four hours and from London to Inverness in fourteen.

Before the war of 1939–45, the British railways endeavoured to increase the speed of the trains by using engines of an improved type. The streamlined "Silver Jubilee," inaugurated in 1935, did the journey from London to Newcastle in under four hours at an average speed of 67·8 miles an hour. Trains like the "Bristolian" and the "Cheltenham Flyer," maintaining average speeds of 67·3 and 71·1 miles an hour respectively, were among the fastest in the world. The "Coronation" went from London to Edinburgh in six hours, and the West Riding Limited did the journey from London to Leeds in 2 hours 43 minutes. Still faster was the "Coronation" on its run from London to York; it covered the distance of 188 $\frac{1}{4}$ miles in 157 minutes at an average speed of 71·9 miles an hour. The effects of the war, especially the heavy wear on tracks and rolling stock, had not permitted a return to these pre-war speeds by 1948, when the railways were nationalised and amalgamated into a single organisation designated British Railways.

ROAD TRANSPORT. The advent of the internal combustion engine has caused road traffic in Great Britain to assume very great proportions. After the war of 1914–18 the increase in the number of vehicles on the highways became extremely rapid. For instance, transport through the streets of Liverpool and its neighbourhood increased tenfold and in some parts twentyfold between 1919 and 1929 ; on the road from Bristol to Gloucester it increased by 1400 per cent. between 1913 and 1926 ; and on the roads in Cornwall by 300 per cent. The roads were unable to carry the growing amount of traffic, and it was estimated that some £20,000,000 a year was lost owing to congestion in Greater London. The Road Traffic Act of 1930 laid the foundation of new legislation for road users. In 1936, a system of trunk roads was established by Act of Parliament, comprising 18 per cent. of the first-class roads, which has a total mileage of 27,000. The total number of motor road vehicle licences rose in Great Britain from 600,000 in 1922 to 2,000,000 in 1929 and 3,113,000 in 1946. On the other hand, the number of horse-drawn vehicles fell from 230,000 in 1922 to less than 15,000 in 1936.

But the competition of the motor car and lorry was not only fatal to the horse, but it also deprived the railways of much of their freight. The railway companies estimated that between 1923 and 1930 the motor car had caused them an annual loss of £10,000,000

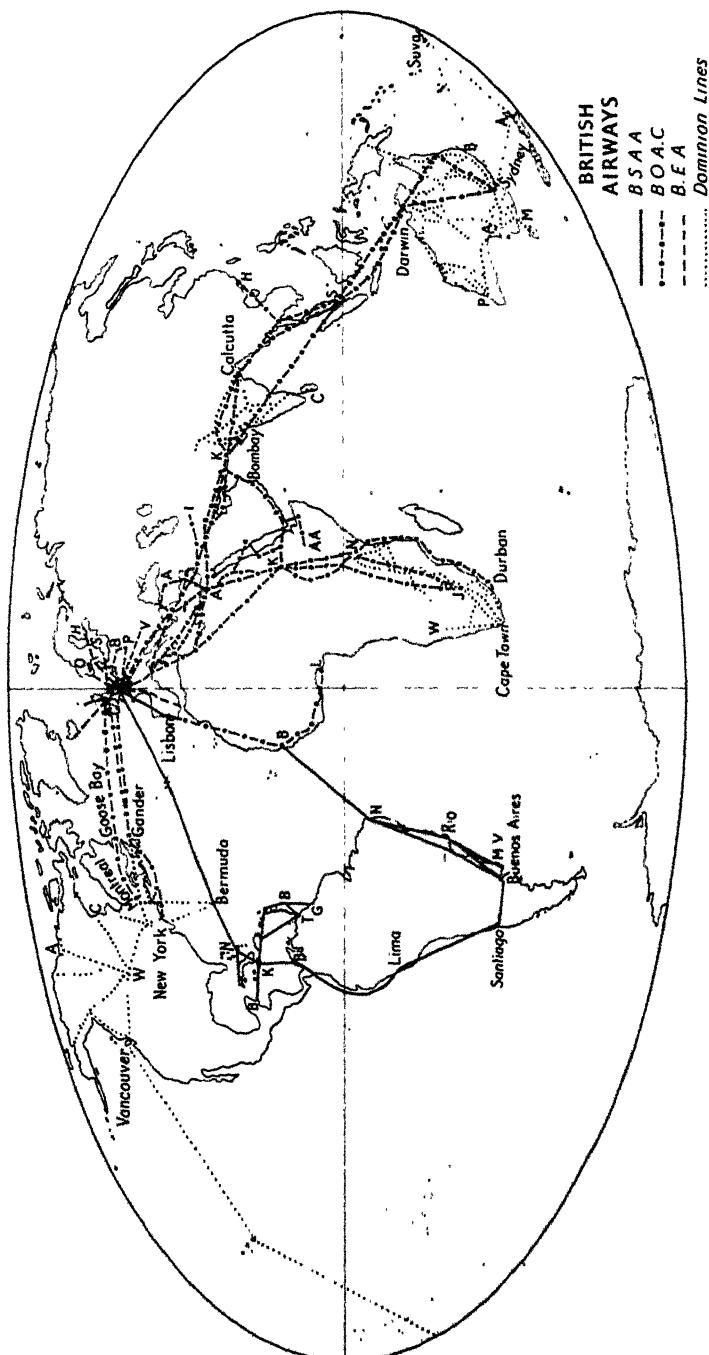


FIG. 77. British Airways, 1949.

and the lorry a loss of £6,000,000. Apart from the growing number of private cars, regular motor bus services take passengers to all parts of Britain at fares lower than those of the railways. Express services run from London to Oxford, Liverpool, Edinburgh, Glasgow, and other large towns ; whilst others ply between important provincial centres like Sheffield and Manchester. The number of fare-paying passengers travelling by road (including, however, those travelling by bus in London and other towns) was estimated at 6000 million in 1936, whilst those travelling by rail (including those travelling by the Tubes and Underground railways in London) numbered 1257 million. There is also a tendency for goods to be carried by road rather than rail. For this purpose the lorry has the great advantage over the train that it goes from door to door and so avoids handling, thus reducing cost, time taken in transport, risk of damage, and the expense of packing. Road haulage has won the day so far as short distances are concerned, though the railways are still the most important form of long-distance transport. But in the British Isles journeys can rarely be long, for none of the towns is far from the sea. Consequently, the geographical configuration of the islands is one of the main causes of the great expansion of road traffic.

To check a rivalry which was as useless as it was costly, the railway companies preferred to co-ordinate transport by road and rail as far as possible. Little local railways have been closed down ; for instance, in 1929 trains stopped running on the Forest of Dean line and on that between Halesworth and Southwold. Then the great companies organised road services for collecting and delivering goods at some hundreds of important stations. The Great Western Railway was the first to adopt the plan of using motor-driven vehicles to supplement the trains, and in 1929 it had 113 lorries plying between the stations and the rural areas. It established motor repair shops in several of the larger towns. In 1933 the Government undertook to regulate the co-ordination of transport. Though these changes reduced the loss caused to the railway companies by road competition, they nevertheless definitely established the victory of the motor-driven vehicle. Whilst the number of these vehicles increased together with the mileage of first-class roads, the total mileage of the British railway system has not only ceased to expand, but is even diminishing.

The growing road traffic in London has caused acute problems. Efforts have been made to solve these by constructing large radial arteries, like Western and Eastern Avenues, and great circular roads, like the North Circular and the North Orbital. A further measure has been the fusion of all passenger services under the unified control of the London Transport Executive.

AIR TRANSPORT. Another form of transport also tends to lessen the predominance of the railways. While the motor vehicle deprives them of the greater part of their short-distance traffic, the aircraft competes with them in long-distance carriage of passengers, mails and valuable goods of little bulk. Since Blériot first landed on English soil in 1909, the aircraft has become an ordinary means of communication. In 1935 air traffic amounted to 5,900,000 ton-miles ; in 1946 this had risen to 48,760,000 ton-miles. In the first of these two years the number of fare-paying passengers carried was 200,000 ; in the second 423,000. The war which intervened greatly favoured the development of aviation and the familiarity of the public with it. At the end of the war this form of transport was nationalised and put under the direction of three corporations : the British European Airways Corporation, which controls the airways of the Continent ; the British South American Airways Ltd., which controls the line running to South America and the West Indies ; and the British Overseas Airways Corporation, which controls the lines running to other parts of the British Empire and to extra-European countries. The last corporation often works particular routes in conjunction with an appropriate Dominion organisation. British air routes penetrate to all parts of the world not shut out by an 'iron curtain'. The possibility of completing the journey to or from Canada in a single day and to Australia in four days necessarily renders co-operation between the scattered parts of the Empire far easier and may even bring within practical range the formation of an effective Empire Government.

The small area of Great Britain does not call for the establishment of internal airways, except to outlying parts. Thus, regular services have been established to the Channel Islands, Belfast, and Scotland, in which last Scottish Airways has established a network of routes connecting Glasgow and Aberdeen with Inverness, Oban, the Hebrides, Orkney, and Shetland. A large number of private companies offer the hire of aircraft for special journeys to all parts of the island.

To serve all these aircraft a large number of airfields have been constructed. Every town of any size possesses a municipal airfield, in addition to which there are four main airports : London airport at Heathrow on the Bath Road, Northolt on Western Avenue for the services of British European Airways, Poole Harbour to accommodate the flying boats of the British Overseas Airways Corporation, and Prestwick in Scotland as an alternative landing ground for aircraft from North America.

It is clear that the aircraft has become a rival to the train, steamer, and motor vehicle for the carriage of passengers and

valuable or perishable goods of small bulk. But heavy goods must still be carried by surface transport, and the expense still attaching to air travel leads to a curtailment of its use.

4. POPULATION, TOWNS, EMIGRATION

In 1931, the British Isles contained a population of 49,193,475, with a density of 405 persons to the square mile. In 1937, the total numbers were estimated at 53,580,000. The only European countries which have a larger population are Russia and Germany, whilst Belgium and the Netherlands alone show a greater density. This vast number of inhabitants has accrued within a few generations, owing to the economic progress which prodigiously improved the means of securing the necessities of life. As far as mere calculation can establish the fact, the population of England and Wales seems to have remained stationary so long as the people depended mainly on agricultural resources. About the middle of the 14th century the Black Death killed off nearly half the population and left only $2\frac{1}{2}$ million people alive. But at the beginning of the same century, as well as during the course of the 16th and 17th and until the beginning of the 18th, the total number of inhabitants oscillated round five million. Stagnation ceased at the touch of commercial and maritime activities, and in the hundred years between 1700 and 1801 the population rose from 5,475,000 to 8,893,000. Up to this time France and even Italy had contained larger populations. In the 19th century the population of Great Britain and Ireland increased by leaps and bounds, rising from 15,800,000 in 1801 to 27,300,000 in 1851, and 45,300,000 in 1911. This was an almost threefold increase. If the population of Ireland, which is mainly rural and which lost half its numbers between 1841 and 1911, be left out of account, the increase in the United Kingdom will be seen to have taken place mainly in the industrial population of Britain, which between 1801 and 1911 multiplied fourfold.

This marvellous increase owed practically nothing to the introduction of elements from abroad. There are just over 250,000 foreigners in Great Britain, which is a small figure for a commercial nation. The growth has been due to purely internal causes, viz. the excess of births over deaths, and in more recent times to the decrease in the death-rate rather than an increase in the birth-rate. The crude birth-rate remained at 34 per thousand between 1840 and 1875, but does not now exceed an average of 16 per thousand. The preoccupations of a highly civilised society which aims at a fuller and more comfortable life seem to give rise in every social grade and in every part of the country to a limitation in the number of children.

In no other part of the world have economic conditions so rapidly brought about such a great contrast between the agricultural and industrial areas. Before the Industrial Revolution the country districts contained, besides lords of the manors, a large number of freeholders, copyholders, tenant farmers, cottagers, squatters, and farm servants living in their employers' houses, all of whom were tied to the soil. Some of them had the right to collect wood and peat and to pasture their animals on the common land; others owned a few acres of arable; whilst others worked at a wage in the fields of the great landowners. Besides, from the 16th century onwards, the countryside in Yorkshire, Norfolk, Suffolk, Essex, Worcestershire, Gloucestershire, and Somerset contained many families which engaged in domestic industry. In the 18th century the Yorkshire weaver was a peasant who owned or farmed a small holding. He kept a cow and a horse; and, with the help of his family and sometimes of a few journeymen, he wove the yarn spun by the women and girls of the village. Once a week he set off on horseback to take his cloth to the market in Leeds or Huddersfield. But from the middle of the 18th century mechanical inventions brought trouble and ruin into the homes of these scattered workers. The crisis began in the cotton districts and spread mainly from 1820 onwards to the woollen districts. The countryfolk then deserted the villages and sought a living in the towns. The percentage of rural population in England fell from 80 in 1770 to 50 in 1850, to 35 in 1871, to 22 in 1911, and to 20 in 1931-32. Each census taken since 1801 has shown a decrease in the rural population, and some of the country districts are now as empty as the South African *veld*. The English counties to the north of the Humber and Mersey have a density of population of 526 to the square mile, but this figure falls to 56 if the urban population is left out of account. The same contrast is noticeable in Scotland between the industrialised Midland Plain, with its 700 persons to the square mile, and the Highlands, where the district north of Glen More contains but 16 persons to the square mile. On the other hand, Ireland does not show this unbalanced distribution, for the country has remained agricultural. The mean density of the island, including the towns, does not exceed 90 to the square mile. In 1925, whilst in France 215 out of every 1000 persons lived by agriculture, only 56 per thousand did so in the United Kingdom.

The distribution of population shows industry to have been the determining factor which has regulated its movements and changes. At the beginning of the 18th century the centre of gravity of the population of England lay to the south of a line drawn from the Wash to the Severn. A hundred years later the districts north of

PLATE LV



[Photo: *Scottish Daily Record*.]

A. THE FORTH BRIDGE

The railway crosses the Firth of Forth here on its way to Perth and the Highlands.



[Photo: *Champagne, Paris*.]

B. DURHAM CATHEDRAL

Both cathedral and town are built on a rocky spur overlooking the Wear.

[To face page 378.]

PLATE LVI



[Photo: Valentine.]

A. AN OLD STREET IN YORK.

This is Petergate, leading to the Minster whose towers can be seen. Note the overhanging houses on the left.



[Photo: Central Aerophoto.]

B. WIGAN

A cotton-spinning town typical of modern industrial development.

this line, which had become industrialised, contained an equally large population. Some extraordinarily great demographic densities occur. In 1931, Staffordshire and the West Riding contained 1241 and 1208 persons to the square mile respectively, Durham and Warwickshire 1464 and 1572, Lancashire 2687, and Lanarkshire 1804. These vast swarms of people are concentrated mainly in the towns. Consequently, demographic density reaches enormous figures in the more closely peopled districts. London's 585 square miles of surface contain 14,578 persons to the square mile, Liverpool's 43 square miles carry a population of 19,676 to the square mile, and Manchester, also with 43 square miles, shows a density of 17,846. Since 1918 there has been a definite movement of population towards the south from the industrial districts of the North of England, and the country areas of the Scottish Highlands and of Wales are losing many of their inhabitants, who are migrating chiefly to the English Plain.

THE TOWNS. In Britain and Ireland more than three out of every four persons dwell in a town. The proportion of town-dwellers is higher and the urban expansion has been more rapid than in any country on the Continent. In England the urban population formed 50 per cent. of the total in 1851; by 1911 the percentage had risen to 78, and by 1931 to 80. Few countries show as great a variety of town-types. Most of these contain an old quarter, to which has been added a large modern accretion. The older places are local market towns, which are situated either in a plain, as, for instance, York, Carlisle, Norwich, Oxford, Salisbury; or else at the line of contact between mountain and plain, as in the cases of Shrewsbury, Perth, and Aberdeen. Others, like Canterbury, Chester, Lincoln, Durham, Lancaster, and Edinburgh, are on the main natural routes. In the Midlands, through which pass the routes from the four corners of Britain, there is a series of old towns, for which the Danes and Saxons once fought and whose names—Stafford, Warwick, Worcester, Nottingham, Bedford, Leicester, and Derby—frequently occur in the military history of the country. The past remains graven on their appearance and still resists all modern attempts to erase it. They still preserve their quiet narrow streets, timbered houses (see Plate LVIIb), old castles and cathedrals (see Plate LVb) standing amid shady trees, and sometimes the venerable ivy-mantled colleges of their universities.

The typical British town stands at the lowest bridging point at the head of an estuary. In Ireland Limerick, Cork, Waterford, Dublin, Belfast, and Londonderry are all so placed. In England the type is very numerous and includes Bristol, Gloucester, Exeter, Southampton, London, Colchester, Ipswich, Yarmouth, Newcastle,

and many others. Sometimes, as at Canterbury, Lancaster, Chester, and Cambridge, the silting up of the estuary has destroyed the maritime position of the town. But the kindly influence of the sea is all-pervading. At the time of the compilation of Domesday Book the five principal towns in the kingdom—London, York, Norwich, Lincoln, and Chester—still communicated with the sea, and even to-day out of the seventy-two county boroughs in England thirty-two are ports.

A later generation of towns sprang up in consequence of the Industrial Revolution, a generation that owed nothing to the past (see Plate LVIb). These bear little resemblance to the older ones. They are situated on coalfields in districts which were once barren and wild, in hilly areas, or in forests and marshes. To-day, out of forty towns with more than 100,000 inhabitants twenty-seven are on coalfields. Whilst the older town was an independent centre, the newer type may be said to be merely one of a series, for it occurs in groups, in a kind of constellation. There are the cotton towns in Lancashire, the woollen towns in Yorkshire, the iron towns in the Midlands and the Northeast, the Pottery towns, and the towns on the various other coalfields. They have sprung up like mushrooms. Manchester and Leeds were mere villages in the 16th century. Others are still growing up at points where industry is flourishing. Thus, Crewe and Swindon owe their development to railway workshops, Middlesbrough to the Cleveland iron mines, and Grimsby to its importance as a fishing centre. But all the recent growths in Great Britain have taken place to the southeast of a line drawn from Newcastle to Barrow, then through Liverpool to Plymouth (see Figs. 78 and 79).

One of the most curious types is the parasite-town to which the inhabitants of other towns flock periodically. Great Britain contains more and better instances than any other country. By the end of the 18th century they were already numerous on the sunny Channel coasts. ‘Everyone flees on the approach of summer,’ says Ferri. ‘If an enemy were suddenly to seize the coasts of Sussex, Kent, and Hampshire, it would at one stroke capture everyone of importance in England.’ Many places which were formerly unknown owe their growth to this practice of seasonal migration. Fishing villages all round the coasts, like Ilfracombe, Torquay, Weymouth, Bournemouth, Cowes, Brighton, Eastbourne, Hastings, Ramsgate, Clacton, Cromer, Scarborough, Blackpool, Morecambe, and many others have been transformed into prosperous towns with busy streets and trim comfortable houses. Away from the sea watering-places and residential towns are scattered about in healthy or picturesque spots. Some gravitate round London, e.g., Windsor, Maidenhead,

Marlow, and Henley ; whilst others are in the provinces, *e.g.*, Bath, Cheltenham, Leamington, Malvern, Buxton, Droitwich, and Harrogate. In the mountainous parts of the Lake District, Wales,

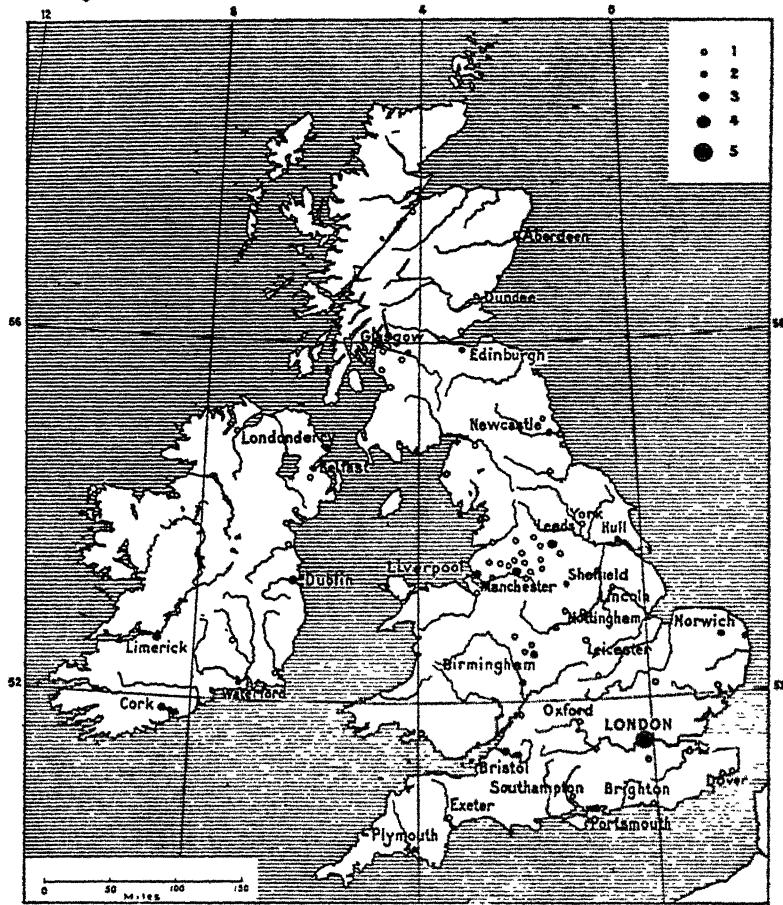


FIG. 78. Towns in the British Isles in 1801.

- | | |
|--------------------------------|-----------------------------------|
| 1. 5000–30,000 inhabitants. | 4. 200,000–500,000 inhabitants. |
| 2. 30,000–50,000 inhabitants. | 5. 500,000–1,000,000 inhabitants. |
| 3. 50,000–200,000 inhabitants. | |

London alone had a population exceeding half a million, and there was no town of between 200,000 and 500,000 inhabitants.

Scotland, and Ireland the beautiful valleys witness an annual influx of holiday makers and are seasonally inhabited by a floating population. British civilisation wears an urban semblance even in its recreation. Practically all the town-dwellers go off on holiday

at least once a year. At these times the industrial population leaves the towns for the mountains or seaside resorts. The towns migrate to the sea, and the sands are hidden by human crowds.

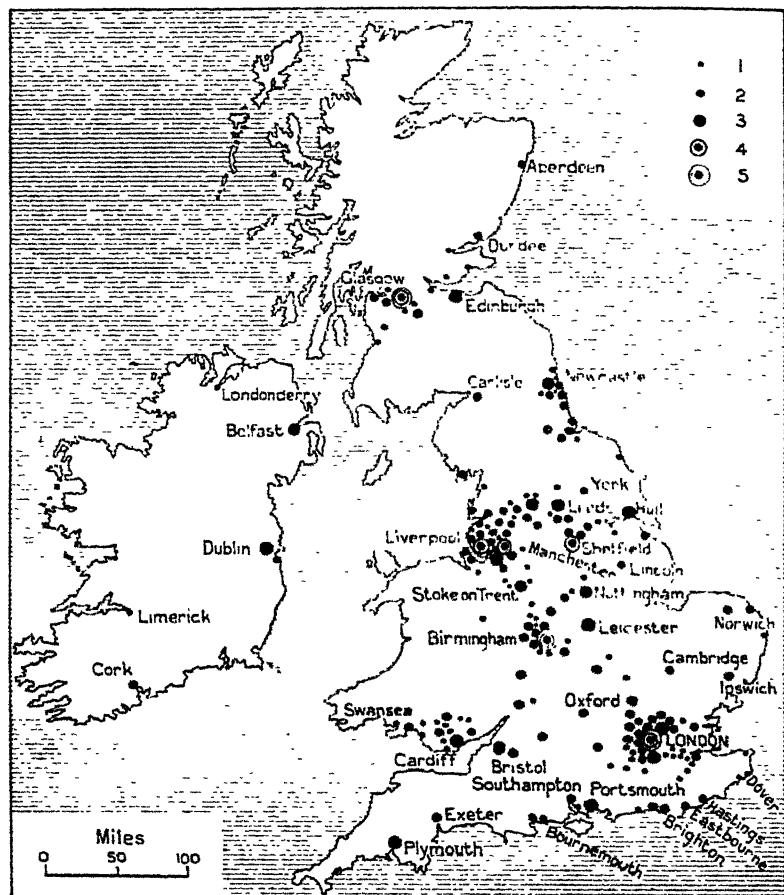


FIG. 79. Towns in the British Isles in 1921.

- | | |
|---|-------------------------------------|
| 1. Some towns of less than
50,000 inhabitants. | 3. 200,000-500,000 inhabitants. |
| 2. 50,000-200,000 inhabitants. | 4. 500,000-1,000,000 inhabitants. |
| | 5. More than 1,000,000 inhabitants. |

Since the beginning of the Industrial Revolution and the consequent rapid growth of population, the towns—and even many villages—expanded in uncontrolled sprawls in which living and working conditions were wasteful and uncomfortable. Besides, modern methods of warfare have made over-urbanisation an

extremely dangerous condition in a State. Hence, plans have been made to relieve the congestion of population in large cities. To begin with, London is to send some of its inhabitants to new towns at Stevenage, Crawley, Hemel Hempstead, and Harlow. These new towns, which are envisaged as increasing in population to 50,000 or 60,000 persons, are not intended to be dormitory suburbs, but will be planned as self-contained communities with their own shops, offices, factories, schools, churches, and places of recreation. It remains to be seen, however, whether the attraction of the great city will leave much freedom to its satellites.

EMIGRATION. The transformation of Great Britain from an agricultural to an industrial and commercial country reacted forcibly on the stability of its population, and was the cause of one of the greatest movements of people the world has ever seen. Emigration began as soon as the first effects of commercial expansion made themselves felt on agricultural production. From the end of the 16th century to the beginning of the 17th, countryfolk who were evicted from their homes by the formation of large agricultural holdings emigrated to the plantations in Ireland and the American Colonies. Under the stimulus of the Industrial Revolution, when the introduction of the modern economic system upset the conditions of life in the rural areas, the exodus assumed gigantic proportions. Migration from the Highlands began at the end of the 18th century, when the landowners deprived the smallholders of their traditional holdings in order to create large sheep farms and united the little cultivated areas to form immense sheep-runs. Everyone who depended for his living on a few acres and his rights to the common pasture was obliged to find some other means of livelihood or else to emigrate. In 1771, a band of emigrants from Kintyre settled on Prince Edward Island; and year by year more and more people sailed for Canada from the wild, barren districts in the Highlands, the Shetlands, and the Hebrides. From 1851 onwards another stream flowed towards Australia, and in the years between 1853 and 1913 Scotland furnished more than a million and a half emigrants. The Great Famine in Ireland in 1846 threw the whole of the lower classes, whose existence was already precarious, into a state of the utmost poverty, and a large number of people, numbering more than four million, left the island between 1850 and 1900. Other causes have contributed to the instability of rural life, particularly in England. Formerly the system of domestic industry maintained a numerous population in the villages and country towns; but the invention of machinery deprived these people of their means of living. Every step in mechanical progress has caused an exodus. About 1820 the application of

steam to the spinning-wheel impoverished millions of workpeople. So great was the distress that emigration had to be organised and arranged officially. About 1840 the introduction of the mechanical loom led to a terrible crisis among domestic weavers, and, as emigration appeared to be the only remedy, the sufferers were piloted to Canada, Australia, and the Cape.

Emigration from the British Isles has proved one of the greatest human overseas movements that has ever taken place. It is difficult to estimate its volume before 1815, as there are no records. Reckoning in round figures, it is agreed that between 1815 and 1920 the enormous number of more than 17 million people left the islands. But from this figure must be deducted first of all the foreigners who passed through British ports and of whose number there is no record before 1856. Then, the number of emigrants who returned home should also be deducted. Unfortunately, records of those returning have been kept only since 1870. Perhaps it will not be far from the truth to assume that between six and seven million emigrants from the British Isles never returned; that of these, some 800,000 went abroad between 1910 and 1920 and nearly two million between 1880 and 1910. The movement reached its height in the middle of the 19th century. Departures rose from 60,000 in 1843 to 250,000 in 1847, to 300,000 in 1849, and to 370,000 in 1851. During the last-named year the daily average exceeded 1000 persons.

The great stream of emigration has slackened at times, but has never ceased. In fact, the persistence of emigration seems to indicate that the habit is a natural principle, an essential feature of British civilisation. Out of every 10,000 persons 44 emigrated in 1841, 120 in 1851, 44 in 1861, 64 in 1871, 57 in 1891, 41 in 1901, and 60 in 1911. The war of 1914-18 checked the movement, and, so long as the struggle lasted, the number of those returning home was greater than that of the emigrants. But from 1918 emigrants began once more to outnumber those returning. In 1919 the excess was 27,000, in 1920 173,000, in 1926 166,000. But the trade depression in 1930 again caused a decrease in the number of emigrants, and since 1931 immigration has been greater than emigration. The number of emigrants since 1932 has been less than 30,000 a year.

Emigration from the British Isles has been mainly to the United States, Canada, Australia, and New Zealand, where the population is largely derived from British stock, and to South Africa. Owing to the start which they had in colonisation, the United States long remained the chief destination of the emigrants, including a large number from Ireland. Since the early years of the 20th century, however, a growing preference has been shown for the Dominions. The United States still received the greatest number in 1904, but

the Dominions have headed the list since 1910, taking 70 per cent. of the emigrants in 1912. The following table shows the growing diversion of emigration to the Empire, which now absorbs five-sixths of the emigrants.

Destination of Emigrants from the British Isles

	U.S.A.	Canada.	Australia and New Zealand.	South Africa.
	%	%	%	%
19th century .	65	15	11	5
1901-03 . .	51	21	5	19
1913 . . .	21	53	24	0·2
1920 . . .	29	44	17	6
1923 . . .	29	36	16	15
1936 . . .	5·5	7·5	18	17

The colonising movement caused by emigration from the British Isles has founded five Anglo-Saxon communities which have reached different stages of development and are made up in a varying degree of British stock. The United States, which has a population of 123 million and is the largest of the five, is no longer a part of the British Empire. The other four, including Canada with a population of $11\frac{1}{2}$ million, Australia with seven million, New Zealand with $1\frac{3}{4}$ million, and South Africa with a white population of two million, are Dominions, that is, independent nations closely associated with the Mother Country. Emigration due to economic changes which have come over the British Isles has thus furnished the human basis for a Greater Britain.

CHAPTER XIV

SHIPPING. COMMERCE. THE EMPIRE.

1. BRITISH SHIPPING

THE foreign trade of the United Kingdom can only be carried on by sea and therefore depends on the possession of a large mercantile marine as well as the command of the ocean routes. This double necessity was imposed on the country as soon as its merchants began to trade with distant lands. The art of navigation demands a long apprenticeship, and the English took many years to acquire it. During the Middle Ages goods were carried to and from England for the most part in German and Italian ships. Even at the beginning of the 16th century King Henry VIII was obliged to seek vessels in Genoa and Venice as well as in the Hansa towns in order to form a fleet.

The long voyages undertaken in the 16th century were the school of English seamanship. Ships from Bristol appeared on the fishing banks of Newfoundland, and in the course of regular expeditions thither the crews learnt the trade of the sea. About 1630 the boats which fished off Newfoundland were manned by some 10,000 sailors, who thus became a nucleus of trained seamen for the English merchant navy. No less effective and profitable was the rude school of the Caribbean Sea, where during the second half of the 16th century the English struggled fiercely in piratical raids rather than pitched battles to deprive the Spaniards of the commercial control of the fertile West Indian Islands. John Hawkins's voyages and Drake's expeditions gradually steered the nation towards the wide horizons of the Ocean and gave it a deep sense of its destiny on the waves. At home the transport of coal from Newcastle to London employed a whole fleet of vessels and formed another school of seamanship. But at the beginning of the 17th century the English still lagged behind the Dutch in nautical science. In 1603, Sir Walter Raleigh stated that, whilst an English ship of 100 tons' burden required a crew of thirty men, the Dutch would man it with ten. But the art of shipbuilding developed along with commerce, and from the middle of the 18th century the supremacy of the seas began to pass from the Dutch. The English merchant fleet, backed by the State, formed a special sphere of

activity. The famous Navigation Acts of 1651 and 1660 gave English shipping a monopoly of the transport of goods between England and all her colonies in Asia, Africa, and America. From that moment the English mercantile marine entered upon a period of steady expansion.

The English merchant navy, which in the time of Cromwell consisted of 95,000 tons of shipping, increased to 260,000 tons in 1700 and to 960,000 tons in 1784. The following table shows its growth at different periods. Fishing boats are not included.

Tonnage of British Shipping

Year.	Number of Ships.	Net Tonnage.
1840	21,983	2,724,107
1850	25,138	3,504,944
1900	19,751	9,280,164
1913	20,938	12,119,981
1920	18,616	11,361,084
1924	18,355	11,716,435
1930	18,064	12,454,000
1936	17,208	10,590,000
1946	16,200	10,615,000

N.B.—The figures after 1920 do not include the Irish Free State.

These enormous figures formerly placed the United Kingdom at the head of the maritime nations. About 1880 Great Britain still owned half the world's tonnage, though, if steamships are alone taken into account, she owned only one-third in 1922 and one-quarter in 1935. In 1945 the shipping of the United States, swelled with ships for war transport, had a net tonnage of 19,300,000. But a large proportion of the vessels are unfit for ordinary trade, and, hence, in spite of the statistical diminution in its supremacy, which is largely due to the growth of American shipping, the British mercantile marine is still unequalled. Its flag still prevails on every sea. It is flown by half the tonnage which passes through the Suez Canal and one-quarter of that which uses the Panama Canal. The numbers that sail under it are as numerous as the population of a large town, viz. 200,000. The home country can no longer furnish the crews, which include some 8000 Scandinavians and Dutchmen, and nearly 50,000 coloured sailors, mostly Lascars recruited in India.

OCEAN TRANSPORT. The great business of ocean transport developed along with other British industries and expanded to meet the growing demands of the world market. The use of the steamship for regular transport service, the records made in the

course of voyages, the perfecting of ship machinery, the general use of steel in ship construction, are all British contributions to progress. The first regular steamship passenger service was established in 1812 on the Clyde between Glasgow and Greenock. Mails were first carried by steamship in 1840, when the Cunard Line placed the *Britannia* on the service between Liverpool and Boston. The first iron transatlantic liner, the *Great Britain*, was launched on the Clyde in 1845, and in the same year the first ship fitted with a screw propeller was built. Other inventions which have originated in British shipyards include the twin screw, watertight bulkheads, engines with triple or quadruple expansion, and the turbine. In consequence of this progress, the fast powerful steamship replaced the sailing vessel far earlier in Great Britain than elsewhere. In 1850, steamers still represented one-twentieth of the tonnage of sailing vessels, but by 1890 their tonnage was already twice as great as that of the sailers, by 1900 three times as great, and by 1920 nearly twenty times. Just as the steam engine had concentrated looms in big factories, so it caused the construction of large ships which could be run at a far smaller cost than a number of smaller vessels. The average tonnage of British steamers rose from 138 in 1850 to 1010 in 1936. The giant *Lusitania* of 38,000 tons appeared in 1907, to be followed by the *Olympic* and *Titanic* (45,000 tons). Of recent years the building of huge liners has begun once again with the *Queen Mary* (82,000 tons), which was launched in 1936, and the *Queen Elizabeth* of 85,000 tons, which was launched in 1938. As few private persons have sufficient capital to fit out the ships of a modern steamship line, large shipping companies have come into being. These were first formed in Great Britain : the Peninsular and Oriental in 1837, and the Cunard in 1840. Out of some thirty companies throughout the world, which own 100,000 tons of shipping, more than half are British.

The prosperity of British shipping is due to the vast quantity of goods carried by it. Shipping is necessary to an industrial nation since it cannot work without importing raw material and foodstuffs and cannot exist without exporting manufactured goods. Consequently, the very life of the nation depends on its shipping. To take the year 1936 as an example, there were landed in the ports of the United Kingdom 109,139,000 cwt. of wheat and flour, 96,000,000 cwt. of other cereals, 6,000,000 tons of iron ore, and nearly 2,000,000 tons of textile material ; and there were shipped 4,500,000 cwt. of fish, 110 tons of pig iron, and several hundred thousand tons of yarn, cloth, and iron and steel goods. It should be noticed that, whilst the exports have an enormous value, they occupy relatively little space and are not heavy. Hence, there

would be a great deficit in outward-bound freight but for the tens of thousands of tons of coal which are shipped abroad from Great Britain. These shipments amounted to 46 million tons in 1900, 65 million in 1910, and 62 million in 1924. Since the decline in coal exports to 35 million tons in 1936, there has been a noticeable deficit in outward-bound freight. In 1924, the total net tonnage of ships entering the ports of the United Kingdom (exclusive of coast-wise shipping) amounted to 55 million, whilst the tonnage of vessels clearing was 65 million; but in 1936 the position had reversed, for vessels entering represented a net tonnage of 67 million, whilst those clearing represented 57 million. This tendency has persisted during and after the war, the net tonnage of vessels entering in 1946 being 34 millions, while the net tonnage of vessels clearing was 21 millions. The prosperity of British shipping has been due to the abundance of freight. A large proportion of the cargoes is despatched to and brought from the same countries, and in 1946, 66 million out of 101 million tons, or more than half the quantity of goods passing between Great Britain and countries overseas, were carried in British bottoms.

Mere statistics cannot give a complete idea of the activities of British shipping. Being the world's greatest shipowner, Britain possesses sufficient tonnage to be able to hire out her service to other nations, and her vessels carry enormous quantities of merchandise which do not pass through her ports. Some ships operate on the coasts of South America, the seas of the Far East, or on intercolonial routes and never appear in European waters. Many other vessels are attached to no port in particular, but sail the seas in search of cargo and are directed by telegraph to the places which afford the best opportunities for securing freight. These 'tramps,' which wander about the ocean carrying wheat, cotton, coal, wood, and ore, are nearly all British. Hence, the British flag plays a large part in maritime traffic in every country in the world, including even those with a big mercantile marine. In 1921, British shipping carried one-third of the United States overseas trade and one-fifth of the Japanese. This is no longer true; but maritime transport must still be regarded as one of the most flourishing industries of the United Kingdom. In 1922, it made a clear profit of £110,000,000, plus indirect returns such as marine insurance, re-exports, and the creation of new markets through the carriage of goods.

THE PORTS. The many ocean routes converge on a series of ports on the shores of Britain. These ports are situated and equipped according as they are intended to deal with passengers or cargo. Passenger traffic with the Continent passes through points situated opposite corresponding ports on the mainland. Sometimes these

points are on peninsulas which bring them closer to the Continent. Traffic to Ireland goes through Glasgow and Stranraer to Larne ; through Fleetwood, Heysham, and Liverpool to Belfast ; through Holyhead to Kingstown (Dublin) and Greenore ; and through Fishguard to Rosslare and Waterford. On the Continental side Dover connects with Calais and Ostend, Folkestone with Boulogne, Newhaven with Dieppe, Southampton with Le Havre ; Harwich with Antwerp, Flushing, and the Hook of Holland ; and Grimsby, Goole, Hull, Newcastle, and Leith with Hamburg and the Scandinavian ports. The necessity of making a sea crossing, even though it be a short one between Dover and Calais, and of two changes in the means of transport has suggested the construction of a Channel Tunnel under the Straits of Dover. Investigations by geologists and engineers have proved the scheme to be practicable ; but the English consider that, once the tunnel was made, their country would lose the advantage of its sea frontiers.

Small steamers which do not need deep-water ports are used on the short crossings in European waters. But for longer voyages great liners are employed, and these must have deep harbours. The most important places which provide these are Southampton, London, Glasgow, and Liverpool. Liverpool, Southampton, and Glasgow are used by passengers going to and coming from the Americas ; London, Southampton, and Liverpool by the Far Eastern, Australasian, and African traffic. Before 1939 the passengers sailing from Southampton to the United States in an average year were between 150,000 and 200,000. But even the long-distance traffic seeks ports well advanced on the routes, so as to shorten the sea voyage. Furthermore, air transport has taken its share of passengers, the number so carried in 1946 amounting to 430,000. Being far from the sea and right up at the head of an estuary, London is gradually losing its passenger traffic, which is now going through Southampton. This port, moreover, has almost completely supplanted Liverpool in passenger traffic.

The large cargo ports, on the other hand, are close to the industrial centres and densely peopled areas which furnish freight. Each region has its own more or less specialised outlet. Ireland has an urban port in Dublin and an industrial port in Belfast. In Scotland, Leith is an urban port serving Edinburgh ; Glasgow is industrial ; and Methil, Grangemouth, and Burntisland form a group of coal ports. In England the ports may be placed in five large groups. One of these is urban and includes London, Southampton, Dover, and Harwich. This group serves London's millions, and functions mainly in importing commodities needed by the teeming population and in the transhipment and re-export of foreign and colonial

produce. Then there are two industrial groups : one comprising Liverpool and Manchester, the other Hull and Grimsby. Both of them serve the textile industries of their respective districts. Lastly, there are two coal and metal groups : one consisting of Cardiff, Newport, Swansea, and Bristol ; the other of Newcastle, Sunderland, the Hartlepools, and Middlesbrough. Most of the coal export trade of the United Kingdom is concentrated in these two groups. The part played by these industrial ports in foreign trade is shown by the immensity of their traffic and by the high value of their imports and exports. The following table gives the share which each group takes in the trade of the United Kingdom.

	Tonnage entered, % of total for U.K.	Value of Imports, % of total for U.K.	Value of Exports, % of total for U.K.	Value of Re-exports, % of total for U.K.
1. The London Group (including London, Dover, Harwich, Folkestone, Newhaven, Southampton) . . .	40	50	36	80
2. The Severn Group (Bristol, Cardiff, Newport, Swansea) . . .	9	4	3	—
3. The Mersey Group (Liverpool and Manchester) . . .	16	24	33	14
4. The Humber Group (Hull, Goole, Grimsby) . . .	7	9	8	2
5. The Northeastern Group (Newcastle, Hartlepool, Middlesbrough, and Sunderland) . .	9	2	5	—
6. The Southwestern Group (Dartmouth, Falmouth, and Plymouth—all ports of call) .	6	—	—	—
7. West Scottish Group (Glasgow and Greenock) . . .	7	3	4	1
8. East Scottish Group (Leith, Dundee, Grangemouth, and Aberdeen) . . .	3	4	2	—
9. Northern Ireland Group (Belfast and Londonderry) . .	3	1.5	1	1

This plainly shows that by far the greater part of the cargoes passes through the ports connected with the Thames, Mersey, Severn, and Tyne. The Thames and its associated ports lead in the value of goods imported and exported, and the Mersey and Humber ports come next. Re-exports mainly pass through London and Liverpool. But the conception of the amount of the trade in British ports is incomplete if foreign commerce alone is taken into account. This amounted to 88,767,000 tons of shipping entered in 1936. But to it must be added some 62,295,000 tons of coastwise

trade. The total tonnage of shipping which entered and cleared the ports of the United Kingdom was 276 millions in 1912, 218 millions in 1921, 309 millions in 1938, and 196 millions in 1946. Though London has been surpassed by New York in the grand total of its shipping, the former yet holds first place if coastwise trade is omitted from the reckoning.

2. THE SPHERE OF BRITISH COMMERCE

Great Britain's commercial activities extend to practically every part of the world, and there is no country, however remote, which does not import British goods in British ships. Her sphere of commerce comprises three groups of countries—European, tropical, and extra-European temperate lands—whose trade with Great Britain depends on their geography and civilisation. The share of each in British imports and exports at various periods is summed up in the following table :—

	Percentage of British Imports.			Percentage of British Exports		
	1913.	1922.	1946.	1913.	1922.	1946.
European countries	41	31	18	39	39	38
Tropical countries	19	20	36	27	28	40
Temperate Lands (extra European)	40	49	46	34	33	22

EUROPEAN COUNTRIES. Europe is no longer the principal sphere of British commerce. But long tradition, geographical proximity, and similarities in civilisation maintain a close bond between the islands and the Continent. The nature of the goods exchanged varies with the economic structure of each country. Thus, the Netherlands, being mainly agricultural, send to Great Britain margarine, condensed milk, sugar, straw-paper, butter, and cheese ; and they receive in exchange cotton yarn, machinery, coal, woollen and cotton cloth, and steel goods. Belgium, being industrial, supplies Great Britain with glass and woollen yarn, receiving in exchange cotton and iron manufactures to supplement her own industrial production. Scandinavia sends iron, forest products, timber, and wood pulp ; and imports British manufactured goods. Denmark finds an outlet for her butter, eggs, and bacon in the British market. Before the new policy of economic self-sufficiency was applied by the U.S.S.R., the British and Russian economic systems were complementary ; and whilst the former supplied the

latter with steel, cotton, woollen, and leather manufactured goods, the latter repaid her in foodstuffs, raw materials, flax, hemp, wheat butter, eggs, petroleum, and margarine. Up to the middle of the 19th century Great Britain's trade with Germany consisted of an exchange of manufactured goods for agricultural produce, English cloth being exchanged for German grain. But as Germany became industrialised, she sent manufactured goods, machinery, toys, dyes, glass, cloth, which competed with British goods. The Irish Free State even employed a German, not an English, firm to construct the hydro-electric plant on the Shannon. The war of 1939-45, however, destroyed German economy, which up to the end of 1947 had shown little sign of revival.

In her trade with the United Kingdom France figures as a southern country. Hence, ever since the Middle Ages, French wines, and especially those from Bordeaux, have found a ready market in England. In modern times, in addition to the wines she also supplies her neighbour with perishable forms of agricultural produce, viz. butter, vegetables, flowers, and fruit. But most of her exports to England consist of a variety of manufactured goods requiring a high degree of artistic skill in their production; e.g., dresses, silks, ribbons, cloth, gloves, and motor cars. On the other hand, France is the greatest purchaser of British coal, and she also buys from Great Britain machinery, cloth, yarn, and steel, as well as overseas produce like wool, jute, rubber, and hides which pass through British ports.

British trade with the Mediterranean includes the usual exports—coal, cotton yarn and cloth, woollen cloth, metal goods, and, in addition, fish; whilst each of the Mediterranean countries finds a large, profitable market in Britain for the special produce of its soil and climate. Thus, Portugal supplies wine, fruit, fish, and cork; Spain wine, fruit, and ore; Italy fruit, olive oil, hemp, sulphur, and iron ore; Greece currants; Turkey fruit, wheat, and wool; and Rumania maize, wheat, and petroleum. Altogether, Great Britain's trade with European countries forms 35 per cent. of the Britain's European trade formed 35 per cent. of the total before 1939; and the Continent was her principal export market. Hence it is to her interest that peace and prosperity should reign in Europe.

TROPICAL COUNTRIES. The foundation of English world commerce was laid in tropical lands in the 16th and 17th centuries. West African trade, which depended on the traffic in slaves, lost its main element when this was suppressed. But it regained its prosperity on the establishment of an organised system of plantations. Every kind of product from Africa now finds a market in Great Britain: cotton and oil-seed from East Africa; ivory,

spice, rubber, and resin from Zanzibar ; sugar from Mauritius ; nuts, palm oil, and cotton from Nigeria ; and cocoa, palm oil, rubber, and kola nuts from the Gold Coast and Sierra Leone. On the other hand, bales of English cotton cloth penetrate everywhere among the native populations, by whom they are held in such esteem that they are sometimes used as currency.

Tropical America was reached by English traders through the West Indies. In this vast region British cotton goods, coal, and machinery are sold for a variety of products including sugar, rum, rice, and gold from British Guiana ; sugar, cocoa, coffee, bananas, cotton, and petroleum from the West Indies ; cocoa and petroleum from Ecuador ; and rubber from the Amazon basin.

But whilst the tropical parts of Africa and America are sparsely peopled, the teeming populations of the corresponding regions in Asia form an unbelievably wealthy market. Vast, though now decreasing, quantities of Lancashire cotton goods are shipped to India, Indo-China, Malaya, the East Indies, China, and Japan, where climatic conditions make light clothing necessary. British materials and machinery are despatched to every place in which railways or factories are being built. In exchange for these goods Great Britain receives from each country its special products, e.g., wheat, tea, cotton, jute, and indigo from India ; tea and silk from China ; tin, pepper, and rubber from Malaya ; sugar from Java ; and rice from Siam and Burma.

EXTRA-EUROPEAN TEMPERATE LANDS. With the exception of the United States, the extra-European countries of the temperate belt were late comers in the sphere of British commerce ; and they entered it one after the other, as they became colonised. They are all suitable for producing the same goods as Europe ; they are all peopled by Europeans ; and they all have sparse populations. Consequently, their economic systems associate them closely with Great Britain, for they produce a vast surplus of agricultural produce which finds a ready sale in Britain, whilst they are short of the manufactured goods needed by every European community. Hence, Great Britain imports cotton, wheat, flour, meat, and tobacco from the United States ; wool, wheat, butter, and mutton from Australia ; wheat, timber, and cheese from Canada ; wool, maize, fruit, gold, and diamonds from South Africa ; wool, mutton, and butter from New Zealand ; wheat, maize, and meat from the Argentine ; and nitrates from Chile. For raw materials the United Kingdom exchanges manufactured goods, including woollen, cotton, and linen cloth, machinery, and metal goods. These overseas countries, nearly all of which were formerly British colonies, afford a rich field for the activities of British commerce. Shortly

after the war of 1914–18 Great Britain despatched to them one-third of her exports and drew from them one-half of her imports. The United States alone furnished one-sixth of the imports into the United Kingdom in 1946. Hence, Great Britain holds a prominent position in the economic life of all these nations.

THE RE-EXPORT TRADE. The world trade of the United Kingdom brings to the country large quantities of goods which are not consumed there, but are re-exported. This profitable form of commerce dates from the time when England took the place of Holland as the *entrepôt* for Eastern and tropical produce. Today the re-export trade includes the same kinds of raw materials as those which Great Britain imports for her own use and for which she has become the general market. Cotton, wool, rubber, flax, jute, and hides, as well as luxuries like tea and coffee, are collected from all parts of the world and brought to England in British ships. The value of re-exports of foreign and overseas produce, which amounted to £109,000,000 in 1913 and £103,000,000 in 1922, formed one-fourth of the total value of British exports in 1861–65, one-fifth between 1900 and 1910, one-sixth in 1913, and one-eighth in 1921–22. Besides direct gains, great profits accrue through commission, insurance, discount, and necessary services, and these form one of the factors of Britain's financial power. But since 1920 the re-export trade has declined. The value of re-exports from the United Kingdom fell to £60,000,000 in 1936, and during the war years, 1939–45, it faded away almost to nothing. But in 1946 it recovered to £51,000,000—a figure, however, which includes goods exported for the relief and rehabilitation of liberated countries in Europe.

BRITISH CAPITAL. A very distorted idea of British commerce would be formed from the mere consideration of the vast quantities of goods imported, exported, and transported. The circulation of British capital must also be taken into account. That capital, saved by commerce and industry during centuries, was the basis of Britain's material power. Her money was spread over the world to assist new enterprises, which later yielded further wealth by additional commercial activities. Britain lent money in order to develop new countries, to fertilise virgin lands, and to equip the industry of young nations. In 1936, the amount of capital invested outside the country was estimated at about £3,500,000,000, and the income from it at £212,000,000 in 1929, though the latter figure fell in 1936 to £165,000,000. Of the £3,500,000,000, 40 per cent. was invested in America, 21 per cent. in Asia, 12 per cent. in Africa, 20 per cent. in Australia, and 7 per cent. in Europe. British capital was used to establish factories all over Europe; it opened up oilfields in

the Caucasus, Mexico, Burma, East Indies, Iraq, and Iran; and it constructed railways and harbours in China, Brazil, and Argentine.

But the favourite place for investment was the Empire overseas, and since the beginning of the 20th century there was a strong, growing tendency to make loans to the Dominions and Colonies rather than to foreign countries. Investments within the Empire amounted to nearly £2,000,000,000, of which £440,000,000 were in Canada, £650,000,000 in Australia and New Zealand, £438,000,000 in India, and £250,000,000 in South Africa. During the war of 1939-45, nearly all the investments in Canada were used to pay for munitions bought in North America. But London still acts as a banker for the whole Empire, floats its loans, and raises funds for its public and private enterprises. The railways, mines, factories, plantations, docks, and all the modern developments in India are due to the British. In Bengal alone 63 jute factories, 300 tea plantations, and 530 firms of coal merchants are working with capital which is nearly all British. All the banks, three-fourths of the overseas trade, and all the shipping companies are in British hands. The prosperity of sugar production in India, of wool in Australia, of timber in Canada, of rubber in Malaya, and of gold and diamonds in South Africa has been due to London financiers. At the end of 1936 it was estimated that £1,500,000,000 of British capital was invested in Overseas Government and Municipal Loans; and £840,000,000 in shares in British companies operating abroad, of which £246,000,000 was in foreign and Indian rails, £108,000,000 in mines, £106,000,000 in oil, £84,000,000 in rubber, £40,000,000 in tea and coffee, £24,000,000 in telegraphs and telephones, £10,000,000 in tramway and omnibus companies, £12,000,000 in electricity, and £27,000,000 in banking operations. Besides, the loans to these British companies amounted to £380,000,000, and, over and above this, £700,000,000 was invested in companies registered abroad. About one half of these capital sums were used for paying expenses connected with the war. Much of what remains has been expended since 1945.

Before 1939 the financial dependence in which Great Britain held part of the world, greatly increased her commerce. London became a world bank used by all other nations to balance their accounts. Countries which used her as a financial agent fell naturally under her commercial patronage. Part of the capital advanced reached them in the form of British exports, e.g., railway material, steel tools, and machinery. On the other hand, the interest on these investments returned to Great Britain in the shape of raw material and products. This was the explanation of her

excess of imports over exports. The surplus consisted in part of cereals, meat, wool, and ore, which represented interest on the capital invested abroad and consequently still further enriched Great Britain. It remains to be seen if and how far she will recover her former financial leadership when the ripples of war have subsided.

THE DEVELOPMENT OF FOREIGN COMMERCE. Up to 1913 the value of the foreign commerce of the United Kingdom exceeded that of every other country. But after the war of 1914-18 it was surpassed by that of the United States. In 1921, the proportions were £1,720,000,000 against £2,007,000,000. This relative decline, crudely expressed in figures, is the result of a development which for some time has been slowly modifying the respective positions of the nations of the world. Great Britain's economic predominance seems to have been at its zenith in the decade from 1870 to 1880 ; but after that there appeared signs of the industrial development of the United States and Germany and of the awakening of even younger countries. After the boom in American trade due to the war in 1914-18, Great Britain soon resumed her leading place in world commerce. In 1936, the value of her foreign trade amounted to £923,000,000 as against £571,000,000 in the United States. But British trade has not been able to recover its former position in the world market. It cannot be said to be declining, for the value of Britain's foreign commerce is constantly growing. Between 1854 and 1863 it amounted to £311,000,000 ; between 1874 and 1883 it was £606,000,000 ; between 1894 and 1903 it was £731,000,000 ; between 1903 and 1912 it was £918,000,000 ; and between 1927 and 1936 it was £1,514,000,000. But these increases occur at a slower rate than those of her rivals, and she is faced with competition in both the industrial and the commercial field.

Whilst the export of manufactured goods had increased in the United Kingdom by 9 per cent. between 1880 and 1904, it had grown during the same period by 239 per cent. in the United States and by 61 per cent. in Germany. Foreign manufactures invaded the British market to such an extent as to cause uneasiness among business circles. An official enquiry held in 1897 reported on the seriousness of the competition of the United States, Germany, and Japan : it pointed to the sale of German metal goods in Hongkong, Singapore, and Australia, and of German cotton goods in the West Indies and Malaya ; and it stated that French cloth, American machinery, German chemical products, and Belgian glass were competing with British products in many foreign markets. Year by year similar evidence of competition appeared until the terrible crisis of the war of 1914-18 gave an enormous stimulus

to the American metal industry and to the cotton industry of Japan.

While industrial centres were springing up and developing in foreign countries, a displacement of the commercial centres took place. The markets for the chief world products tended to leave the old *entrepôts* and go nearer to the districts where they were consumed. Direct relations were established between producers and consumers, to the detriment of the distributors. Cotton, wool, cereals, coffee, and petroleum were sent directly to Antwerp, Hamburg, Rotterdam, or Havre ; and the trade thus lost to London became a gain to other ports. Furthermore, several other countries sought to form a mercantile marine, and the work of transporting goods began to fall away from British shipping. Before 1914, German steamship companies ran services from Europe to some of the British colonies. Since the war this tendency has increased. Big markets for rubber, tin, and coffee have been established in the United States, and American and Japanese steamship lines run across seas which were formerly regarded as lying within the special sphere of Britain. In this competition geographical remoteness acts more and more to the disadvantage of the United Kingdom, for certain countries tend to place themselves within the economic orbit of the nearest industrial nations. Parts of the Empire, like Canada and the West Indies, feel the attraction of the United States ; British trade is forced to struggle with the German in Scandinavia and eastern Europe, with the Japanese and American in China, and with the American in Brazil, Peru, and Chile. Up to the last third of the 19th century British trade had kept its supremacy in world markets, but now it is encountering the rivalry of rich, strong, and even young nations which are daily wresting from it some portion of its sphere of operations.

The gravest feature of the situation to-day is the economic revolt which has occurred in every continent against the traditional exploitation by British commerce. To the competition of young commercial rivals has been added that of the industries which have grown up in many countries. This type of competition is the more serious in many markets, since national industries are often protected by effective tariffs. Manufactures have been established in central and eastern European states as well as in the more distant countries of Canada, Brazil, Australia, India, China, and Japan. The industrialisation of the Far Eastern peoples, who comprise half the world's population, has deprived British trade of an enormous market ; and their commerce derives a considerable power of expansion from the use of cheap Asiatic labour. Furthermore, up

to 1931 Great Britain was handicapped by the over-valuation of the £. By 1932 her trade had lost control of the markets in the Pacific and Indian Oceans. The rise of industry in India reduced her total imports by one-third between 1913 and 1933. In 1932, India possessed two and a half million cotton spindles and 186,000 looms ; and its production of pig iron rose from 310,000 tons in 1920 to 1,540,000 tons in 1936. Between 1929 and the invasion of her territory by Japan, China exported more cotton goods than she imported. She built glass works, hosiery and rubber factories, and even machine shops, all producing for the home market.

Finally, Japan flooded Asia, Africa, and South America with cheap manufactured goods. During the trade depression in 1929-34 the value of Japanese exports of rayon rose by 600 per cent., that of window-glass by 450 per cent., and that of iron goods by 800 per cent. The export of nails went up tenfold, that of machinery was doubled. To this must be added the growing export of bicycles, various kinds of cloth, and glass, metal, wooden, and leather goods. So far as quantity was concerned, Japan had become the largest exporting country in the world. In 1930, the value of goods of Japanese origin formed 12 per cent. of the total imports into the Dutch East Indies, and in 1933 this figure rose to 31 per cent. During the same period the value of the imports from the United Kingdom fell from 10 per cent. to 7 per cent. of the total imports. In India Great Britain is still the chief source of supply ; but whilst the imports from Great Britain in 1930 formed 47 per cent. of the total value of the goods imported, in 1935 they formed only 42 per cent. On the other hand, in 1935 Japan's share was 15 per cent., against 10 per cent. in 1930. Whilst the volume of the world's trade was shrinking between 1929 and 1934, Japanese exports actually increased in every direction. The value of exports to Egypt increased threefold to Latin America fourfold, to Siam fivefold. In 1939 the total value of her exports was £210,000,000.

A decline in the British export trade was inevitable in face of the ever-increasing activities of these young rivals. The value of exports, exclusive of re-exports, fell from £801,000,000 in 1924 to £729,000,000 in 1929 and £365,000,000 in 1932. But recovered to £471,000,000 in 1938. The excess of imports over exports, which is usual in British trade, assumed the enormous proportions of £134,000,000 in 1913, £393,000,000 in 1924, and £407,000,000 in 1931. During this last year the world crisis reduced the invisible exports to such an extent that British trade was left with an adverse balance of about £110,000,000. In spite of a great reduction in imports, the country was growing poorer. Great Britain's reaction was threefold : high tariffs were imposed to protect the home

market from the foreign competition which had now become immense ; then by a slow, but dogged, effort British industry began to adapt itself to the new conditions of the international economic system ; lastly, breaking away finally from Free Trade, the United Kingdom, by the Ottawa Agreement in 1932, introduced the principle of Imperial preference into her overseas trade. From that year, Empire produce received preferential treatment in the United Kingdom, and in return the products of the United Kingdom obtained the same privileges in the Dominions. This organisation of trade within the Empire was the result not of a decree applicable to the whole Imperial sphere, but of independent bilateral agreements which regulated the trade between the several countries. From then on, British trade statistics have made a distinction between British and foreign countries.

The Empire supplied 25 per cent. of the imports into the United Kingdom in 1913, and 40 per cent. in 1936 ; and whilst it took 38 per cent. of the exports of the United Kingdom in 1913, it received 50 per cent. in 1938. Thus, the Empire has increased its share in Great Britain's trade and has therefore suffered less than foreign countries have done from the decline in her imports. Since 1932 the recovery in British export trade has been even more evident in the Empire than in the rest of the world. Nevertheless, although trade with the overseas Empire is still the solid foundation of Britain's greatness, and although obstacles have been placed in the way of free exchange of goods in foreign lands, British commerce has not lost its universal character and is still carried on largely with foreign countries.

The war of 1939-45 has greatly altered the overseas trade of the United Kingdom. The rise in the value of imports from £858,000,000 and of exports from £471,000,000 in 1938 to £1,247,000,000 and £912,000,000 respectively in 1946, is an expression of changes in the value of currencies. But the gap between imports and exports is no longer closed by invisible exports in the present circumstances, since the earnings of British shipping and of City financiers have seriously diminished, and the interest which was formerly derived from investments abroad has dwindled almost to nothing. The rivalry of Germany and Japan has been eliminated, but so have the markets provided by those countries. The stimulus given to production in the United States at a time when Great Britain was devoting all her energies to facing German aggression and the subsequent continuance of the manufacture in the United States of ordinary goods, including food and the means of transport, enabled the latter country to displace the United Kingdom in many markets. Nevertheless, Dominions and colonies have supported British trade to

such an extent that in 1946 more than half the retained imports were of Empire origin and nearly half the exports were despatched to the Empire.

3. THE EMPIRE

Within the sphere touched by Britain's widespread commerce are enormous territories which are politically associated with or dependent on her. This Empire took 300 years to build and has reached a magnitude never before known in history. Its 14 million square miles comprise nearly one-fourth of the land surface of the Earth. It is four times as big as Europe and twice as big as South America. Canada alone is nearly as large as, and India is half the size, of Europe. The impression of magnitude given by the Empire is further increased by the discrepancy between the area of the Mother Country and that of her vast dominions, for the latter is one hundred times larger than the former (see Fig. 80).

Area, however, is but a rough guide and never brings out the full geographical significance of facts. In this case, the distribution of the Empire over the Earth's surface must also be considered. Nearly the whole of the Overseas Empire lies outside Europe : 16 per cent. in Asia, 24 per cent. in Australasia, 27 per cent. in Africa, 52 per cent. in America, but only 1 per cent. in Europe. Its territorial constitution makes it an extra-European structure, for the countries of which it is formed are situated in every part of the world outside Europe. It thus differs from the Roman Empire, which centred on the Mediterranean, and from the Russian Empire, whose parts are all adjacent and form a compact mass in the north of the continent of Eurasia. Yet the Indian Ocean may still be regarded as its geographical centre of gravity, because one can travel almost all round its shores without leaving British territory, whether actual possessions or mere spheres of influence. Without going outside the Empire, it is possible to journey from the Cape of Good Hope right through Africa to the Red Sea, from the Red Sea to the East Indies through Arabia, India, and Malaya, and from the East Indies through Australia to Tasmania.

The Empire's population of 500 million persons represents one-fourth of that of the whole world and is nearly equal to that of Europe. The Overseas Empire contains nine times as many people as Great Britain. This demographic disparity between the Mother Country and Empire, though less than the discrepancy in area, has nevertheless been a characteristic feature since the conquest of India and dates from the absorption of the swarming millions of the Ganges valley. India and Pakistan alone contain 70 per cent. of

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the population of the Empire, and the parts of the Empire which are situated in warm latitudes together contain 85 per cent. These vast swarms of natives belong to different races, to differently organised communities, and to every stage of civilised development. Apart from India and Pakistan, which form a world in themselves, there are out of every thousand inhabitants of the Empire 300 whites, who live mainly in temperate climes, and more than 500 negroes and 70 yellow or brown persons,¹ the latter types living mainly in hot lands. Throughout South and East Africa negroes are far more numerous than white men. The majority of the world's Muslim population dwells within the Empire. This very diversity has hitherto enabled a small minority of white men, whose home is outside the tropics, to rule over vast populations dwelling in warm lands. Yet the hegemony of this handful of men in many different lands and over many human beings is also due to the influence of the sea, a principle which is in a sense inherent in the existence of the Empire, since it is itself a basic element in the life of Great Britain.

MARITIME COMMUNICATIONS WITHIN THE EMPIRE. Great Britain's isolation at the western extremity of Europe is only apparent, for the ocean which washes her shores is an ever-open road which enables her ships to reach the remotest ends of the Earth. The sea is the link which keeps the Empire together, and colonial pioneers have all reached their settlements by way of the ocean. Insular instinct has led Britain's colonists and traders to establish themselves on islands and peninsulas, so as to have access to the sea. The expansion of the Empire to places far inland dates from recent times; for long years settlements and trading posts were restricted to the coasts. In 1607 the first settlement was made at Jamestown on the east coast of North America. The first conquest in the 17th century was the island of Jamaica: in the 18th century the tiny peninsula of Gibraltar. For a whole century the English avoided penetrating into India and occupied only fortified points along the coast. Fort St. George at Madras, the island of Bombay, and Fort William at Calcutta are classic types of trading post. In Africa during the greater part of the 19th century British occupation was limited to coastal stations at Bathurst, Cape Coast Castle, and Lagos. Only during the last twenty years of the century did England aim at penetrating farther inland and at occupying Nigeria, Kenya, Uganda, Nyasaland, and the Sudan. In Canada the first strip of country settled lay along the St. Lawrence River, which is navigable by ocean-going ships. Expansion into the prairies came much later. In Australia the settlements originally grew up on the shores of well-sheltered harbours like Port Jackson (Sydney),

¹ The remaining 130 can only be classed as "indeterminate".

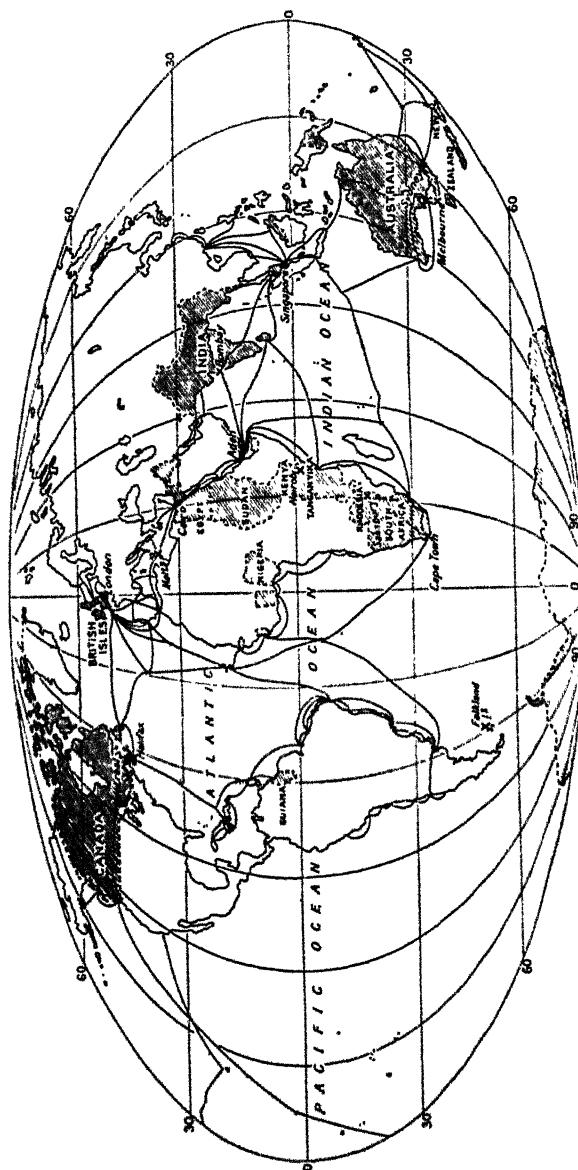


Fig. 80. The British Empire.
— Telegraph Cables. X High-power Wireless Transmitting Stations.

Port Phillip (Melbourne), Port Arthur (Tasmania). British colonies have always been based on the sea, and their great towns and centres of population like Auckland, Melbourne, Sydney, Cape Town, Montreal, Calcutta, and Bombay have always been built on the coast.

The British Empire, like all other great empires, depends for its unity on a system of ocean routes. In the course of centuries the English have successively occupied every point along the ocean routes necessary for the safety of their traffic. In the Mediterranean, where two-thirds of the tonnage is British, the Empire maintains two great fortified naval bases, one at Gibraltar and the other at Malta. The security of the Suez Canal is regarded as one of the conditions of the existence of the Empire, and, though Egypt has been given her independence, precautions have been taken to secure the Canal in time of war. Naval bases and refuelling stations have been established round the Imperial waters of the Indian Ocean and on islands scattered about within it. On the Cape route to India there are Cape Town, Port Elizabeth, Port Natal, Mauritius, Zanzibar, and the Seychelles. The entrance to the Red Sea is guarded by Perim, a waterless, barren island which contains a deep, well-sheltered harbour; and by Aden, which stands on the shores of a bay strewn with sandy islets, is exposed to a broiling sun, and gets its water from distilling plants and ancient cisterns. Then there are Galle and Colombo in Ceylon; and on the Far Eastern Routes and along the Malay Straits, Port Blair, Georgetown in Penang, Singapore, and Victoria in Labuan; and, still further, another Victoria in Hongkong. Lastly, in the middle of the Indian Ocean there is the island of Diego Garcia in the Chagos Group, where the direct route from Aden to Australia crosses that from Cape Town to Colombo; and the Cocos, or Keeling, Islands on the route from Ceylon to Australia.

Like the French, Spanish, Portuguese, and Americans, the English have taken precautions in the Atlantic. Along the coast of Africa they have bases at Freetown, Elmira, Walfish Bay, and Cape Town; in the open ocean Ascension Island and St. Helena, through which passes the direct telegraph cable from England to the Cape; in the Southern Ocean, the Falkland Islands on the route from Australia and Chile round Cape Horn to Europe. Bermuda, which is a curious instance of a British naval station, is situated on the line of communication between Canada and the British West Indies. It is a collection of coral reefs sheltering a tiny inland sea which is entered only through difficult, winding channels. On the European side the Atlantic coast is guarded by allies of long standing. Portugal, Britain's oldest ally, affords a port of call at Lisbon for

ships on the routes to Africa, the West Indies, and South America ; and out in the open sea lie the Portuguese islands of the Azores, the Madeiras, and the Cape Verdes. On the Pacific coast of Asia Hongkong guards the approaches to China. But since the return of Wei-hei-wei to China in 1930, there has been no other British naval base on the western side of the north Pacific. Hawaii and the Philippines are held by the United States, and the Panama Canal is not under Britain's control. On the other hand, the ocean routes in the Western Pacific run past a chain of bases in the multitude of South Sea Islands. Thursday Island in Torres Strait off the north-west coast of Australia is a coaling station for ships making for eastern Australia, and Tonga and Fiji are landing-places for the trans-Pacific telegraph cable from Canada to Australia. Thus, from one stage to the next, from station to station, there is a continuous chain which leads British ships across the world from one piece of British territory to another. The straits, sounds, isthmuses, islands, and capes are all organised to ensure the passage of the ships of the Empire.

Imperial solidarity is strengthened by everything that assists ocean traffic. The keys of the British system communicate with each other by submarine telegraph and wireless (see Fig. 80). Of the sixteen cables which run from Valentia Island to North America twelve land in Newfoundland or Canada. Canada is itself connected in this way with Bermuda, Jamaica, and the British West Indies. Since 1902 she has also been in communication with Australia by the 'All Red Line,' which starts from Vancouver, and after touching at Fanning Island, Fiji, and Norfolk Island, runs to Brisbane in Queensland and to Doubtless Bay in New Zealand. Since 1901, a direct cable, which avoids the coast of Africa, has connected England with the Cape by way of Madeira, St. Vincent, Ascension Island, and St. Helena. Since 1870 another wholly submarine cable has run from London to Bombay by way of Lisbon, Gibraltar, Malta, Alexandria, Port Said, and Aden. This line has been made independent of even the ancient Portuguese ally, for in 1898 a direct cable was laid from London to Gibraltar. Another cable, laid in 1901, runs directly from Perth in Australia through the Cocos Islands and Mauritius to Durban in South Africa.

To the network of submarine cables and steamship services has now been added a system of airways operated by the British Overseas Airways Corporation, which ensures communication between London and India, South Africa, Australia, New Zealand. Other services projected or in operation, and British South American Airways, which run services to the West Indies and South America, complete the immense system which crosses every continent and

every ocean and year by year shortens the time taken in carrying passengers and mails between the most distant parts of the Empire. Thus, the Earth is girdled with a complete British system of communications, which enables the thoughts and decisions of the British world to be exchanged and to circulate freely throughout the universe.

A clear conception of the structure of the British Empire is only to be formed, therefore, by avoiding comparison with the empires of the past. On land geographical dispersion is a cause of weakness in a state, since it entails the danger of disruption. But the British Empire, which began on an island and is founded on trade, draws its strength from the sea, whose waters form a highway that binds together the Mother Country and her associates and dependencies all over the globe. The ocean is a common bond, a vital feature of everything that is British. But for it, the Empire would shatter into mere fragments of territory, into a number of disconnected parts.

TYPES OF COLONISATION. The British Empire includes areas in warm climates which are unsuitable for permanent white settlement, and also temperate countries in which the European can live. Consequently, colonisation of exploitation. Each type gives rise to a special form of civilisation. The value of the tropical colonies since their foundation has been due to the large quantities of useful produce which they supply to trade, *e.g.*, spices, cotton, tobacco, coffee, tea, cocoa, sugar, rice, oil-seed, and rubber. Colonisation in these regions consists of organising the exploitation of these products under white supervision. This type of colony still offers the Mother Country a profitable market for her manufactured goods. In 1925, the tropical colonies, including those of the Dependency of India, took 57 per cent. of the total value of the exports to the Empire from the United Kingdom ; and 51 per cent. of the goods exported from every part of the Overseas Empire into the United Kingdom was derived from them. Omitting Great Britain herself, the tonnage entering or departing from tropical lands within the Empire represented 62 per cent. of the total tonnage trading with the Overseas Empire.

When the characteristic features of the Empire within the tropics are analysed, an amazing assortment of varieties of colony are found, differing from each other in area, development, and in the object of their exploitation. India and Pakistan afford the most remarkable edifice of tropical colonisation and exemplify all its special features on a large scale : the presence of a mere handful of Europeans among a multitude of natives (one Englishman to every 2000 Indians) ; and the production of huge quantities of economic products by native labour. The British system aims at preserving

the forms of native civilisation, and merely directs it towards the cultivation of economic products. In these former Dependencies, which once exported spices and muslin, the British established a huge market for wheat, cotton, jute, opium, tea, and oil-seed; and even manufacture sprang up freely. The system has succeeded in politically unifying and awakening national consciousness in India and Ceylon, which have been given full Dominion status, and in Burma, which was permitted to withdraw from the Empire in 1947.

The vast territories inhabited by settled peoples are very different from the ports of call, the trading posts, the *entrepôts* in distant waters, the minute areas in which the trade and commerce of immense regions is concentrated. Such, for instance, are Aden, which stands on the threshold of the Arab world ; Singapore, which lies in the centre of the Malay world ; and Hongkong, which is situated at the gates of the Chinese world. In this last place British commerce organises transhipments and re-exportation on a grand scale. The produce of the Far East is collected here to be despatched to European and other markets, and goods imported from Europe and elsewhere are distributed through the Far East. In 1920, Hongkong led all the world's great seaports, including London, New York, and Liverpool, with its 40 million tons of shipping, inclusive of entries and departures. Even if this leading position was only temporary, Hongkong nevertheless maintains a respectable place among the ports of the world.

On the other side of the world, the fertile, densely peopled West Indian Islands, whose prosperity depends on plantations of sugar-cane, cocoa, cotton, and coffee, are strikingly different from the colonies in tropical Africa, in which cultivation is on an extensive system and is carried on by natives, some of whom have not progressed beyond the collecting stage of civilisation. The contribution made to trade by these people is mainly due to their traditional methods of cultivation or to the rapid collection of spontaneous produce like nuts, palm oil, ground-nuts, and kola-nuts in West Africa ; and oil-seed, copra, and rubber in East Africa.

By peopling temperate lands across the seas with men of her own stock, Great Britain has founded a different type of colony from those which lie within the tropics. She has made huge areas into colonies in the proper sense, *i.e.*, offspring of her blood and character, and without a touch of native element. For wherever the Anglo-Saxon has settled, he never interbreeds with the native peoples, as the Spanish and Portuguese have done in South America. Consequently, there is no fusion or assimilation. The disappearance of primitive tribes has given free play to the establishment of the kind of agricultural life introduced from Europe by the British settlers. This

colonisation has been mainly the work of little cultivators who have been driven from their homes by economic crises and who have taken with them a love of the soil and the hope of acquiring land. From the beginning it has been distinguished from that of other nations by a system of land tenure which has ensured the liberty and independence of the settlers. In the French and Spanish colonies, on the other hand, the grant of land was made on a feudal basis. To the British settler the ownership of his land is a condition of his existence. Hence, in each of the colonies of settlement the appropriation of land has been organised on a democratic system. The guiding principle in colonisation and settlement has been that the soil is valueless without man and that every settler should have his house and his piece of land. Consequently, in the British colonies the social structure is rather different from that of the Motherland and is hostile to an aristocratic system of land holding. Even in parts of Australia where the great landowner still prevails a class of smallholders is developing. New Zealand has presented from the beginning the type of settlement effected by independent farmers whose holdings have been of small or medium size. The ease with which rural settlement has been possible in Canada has caused the growth of a numerous class of petty landowners. Throughout the new countries in the temperate belt the democratic character of British colonisation has been established.

BRITISH CIVILISATION. The colonies of settlement are scattered over the face of the Earth. They are all remote from the Motherland and are separated from each other by enormous distances ; and some of them have conflicting interests. Yet they are united by a common bond of manners, inclinations, and ideas ; they are alike in the forms of their material and moral life ; and they are joined together and linked to one another by a single type of civilisation. Throughout the Empire there are the same external customs, the same foods are eaten, the same kinds of clothes worn, the same types of house are used, and the same sorts of recreation enjoyed. There is a high standard of life, marked by a demand for white bread ; a large quantity of meat is eaten, and the meals are plentiful rather than dainty. Tea has become the national beverage, a fact which has made that commodity as common as salt and bread in British countries. The desire to be comfortable and practical is shown by the clothes and footwear used. Privacy is secured by each family having a separate dwelling. There is a demand for physical exercise through games, because of the conviction that muscular exercise gives both health and happiness. Settlers from the various parts of the United Kingdom have taken with them to the Dominions their favourite games and sports, viz. football, cricket, hockey,

golf, and lawn tennis. Horse-racing is all the rage from Canada and India to South Africa and Australia. But the Anglo-Saxons are united by other ties which are as strong as the material bonds: they speak the same language, have similar religious beliefs, owe allegiance to the same Crown, live under the same political institutions, and form one great community whose members, in spite of their particular interests, feel a sense of unity across the world.

English is the mother tongue of more than 150 million people who live outside the British Isles. The majority are in the United States, which no longer form part of the Empire. Not all Americans are of British stock, yet they all speak English. As the language spread over vast expanses of country from the shores of the Atlantic to those of the Pacific it has undergone modifications. It has become overloaded with slang and has developed many local shades of accent. Englishmen sometimes smile on hearing the speech of their American cousins. But the spread of their language beyond the limits of their own political community represents an expansion of the material and moral heritage of the English nation, and is a source of profit and influence. British ideas and goods penetrate into the United States more easily than do those of other nations, because the English language is a ready means of exchanging thoughts and of transacting business.

To the 50 million people in the British Isles, the 130 million in the United States, the 11 million in Canada, and the 11 million in the Dominions in the Southern Hemisphere, all of which form more or less compact groups, must be added the little scattered communities of Englishmen established for the purpose of trade at Calcutta, Bombay, and Rangoon or along the ocean routes at Singapore, Hongkong, Shanghai, and a score of other places. Carried everywhere by the sailors and traders of a nation whose commerce extends to the four corners of the globe, English is tending to become a universal language. Along the shores of Far Eastern countries it forms the basis of a jargon known as 'pidgin English,' which is a kind of *lingua franca* in all the ports open to international trade. Sometimes Chinamen from different provinces, who do not understand each other's dialects, converse in pidgin English. In both China and Japan many documents of general interest are published in English. In the polyglot Indian peninsula it is the only language in which all Indians can speak to each other.

By offering a common language to their subjects, the ruling people have given them an immensely strong bond of union. English serves as a medium between the educated classes in India and the Western world. Even outside the Empire the language enters current speech in every part of the globe, either in the form of

technical or commercial expressions, or of weights, measures, and money whose use Great Britain's economic hegemony has imposed on the whole Earth. The passage of the English language beyond the frontiers of the Empire gives some idea of the wide spread of British influence, a development to which certain characteristics of the language have contributed. The derivation of three-fourths of its words from Germanic and Scandinavian sources makes it easily learnt by the Germanic peoples ; whilst, owing to its numerous borrowings from the Latin tongues in the realms of art, science, politics, and commerce, it sometimes appears under familiar forms to the Latin peoples. Owing to the simplicity of its accidence and syntax, it can be learnt without difficulty by foreigners of even a very rudimentary education. Hence, it forms one of the strongest pillars of British influence.

The language affords a common medium of human thought from one end of the Empire to the other. In spite of local peculiarities, men's minds are shaped in a common mould by reading the same books and imbibing the same ideas. Australia, for instance, imports from Great Britain nearly all her reading matter. Many young men from the Dominions and Colonies are wholly educated or at least finish their education in the Mother Country ; and the stamp of Oxford and Cambridge is noticeable throughout the Empire. The tendency towards the official association of British and Overseas universities is shown by recent regulations of the Universities of Oxford and Cambridge which permit the affiliation of universities or colleges overseas, and arrange for the equivalence of degrees. Since 1945, moreover, Colleges affiliated to the University of London have been set up in various parts of the colonial empire.

IMPERIAL UNITY. In addition to what has been said above, the unity of thought in the Empire is the constant care of a number of societies which recruit their members throughout the British territories. In the world of science there are the Universities' Bureau of the British Empire, founded in 1912, and the British Association for the Advancement of Science, some of whose meetings have been held in Toronto, Cape Town, and Sydney. In the world of economics there are the Imperial Shipping Committee ; the British Empire Producers' Organisation ; the Empire Resources Development Committee ; the Empire Cotton Growing Association ; and others. Very significant are the great imperial leagues which are intended to awaken and maintain the corporate spirit of the Empire. They include the Royal Empire Society, the Victoria League, the League of the Empire, the British Empire League, the Navy League, the Over-Seas League, etc. The existence of all these manifestations of British unity recalls the enthusiastic words of Froude : 'The

people at home and the people in the colonies are one people. The feeling of identity is perhaps stronger in the colonies than at home. . . . We, the people, always regarded them as our kindred, bone of our bone and flesh of our flesh.¹

In whatever part of the world British settlements occur, they will be found to have a type of government based on the external forms of the English system and, moreover, to be guided by geographical conditions towards the establishment of the federal principle; for British settlers take abroad with them their political as well as their moral observances. Wherever they have established a new home, they regard themselves as having all the rights and liberties which they enjoyed in the Motherland. Hence, the principle of representative government has been established in every colony of settlement. A political system modelled on that of the Mother Country was set up in the American Colonies—which were later to win their independence and become the United States—as soon as the growth of population warranted it. The system normally comprises a governor who is appointed by the Crown, represents the Home Government, and is bound to act constitutionally; an upper house; and a lower house, or Legislative Assembly, in whose hands lies the chief power, since it is directly elected by the people. This representative system is followed by a parliamentary régime which is introduced into the colonies, giving them self-government by responsible ministers and complete control by the representatives of the people. The autonomous system was established first in Canada in 1839, then in Nova Scotia and New Brunswick in 1848, in the Australian Colonies and New Zealand between 1846 and 1859, in Cape Colony in 1872, in Natal in 1893, and in Western Australia in 1890. Dominion parliaments, modelled on that of Great Britain, often give a traveller the impression that he is still in England, so similar are the regulations, procedure, forms, and machinery of government.

The same political evolution, based on principles of liberty, which caused the British colonies to adopt first a representative then a parliamentary system, has led them naturally by the force of spontaneous development to federation. Canada, Australia, and South Africa, like the United States, have all adopted the mode of political synthesis which seems to be a distinctive feature of Anglo-Saxon communities overseas. The expansion of the originally isolated settlements is followed by the union of the colonies in economic affairs and by their close political association in a federal system. Thus, a new type of state has been evolved which is utterly different from our old centralised states in Europe. The

¹ *Oceana*, 5th Edit., Ch. I., pp. 14–15.

first of these federations gave birth to the Republic of the United States of America in 1776. Nearly a hundred years later a second was established in Canada in 1867. It was Australia's turn in 1901, South Africa's in 1910. These later colonial federations have been founded in the purest spirit of loyalty to Great Britain ; but the influence of geographical surroundings was certainly at one time tending to transform them into independent nations. Each of the Dominions has developed a national consciousness that has taken its place in the minds of the people side by side with the feeling of loyalty to the Mother Country. These two sentiments seem hitherto to have existed without detriment to each other. But the interests of the Home Country and of her offspring do not always coincide, and their respective attitudes towards political and economic problems have often differed. Consequently, the Dominion Governments have assumed control of their political and economic affairs, and treat with the Mother Country on a footing of complete equality.

To the rise of national consciousness in the colonies of settlement has been added a growing feeling of nationalism among the native peoples in India and in some of the colonies of exploitation. During the 20th century an interest in politics has been awakened in the native peoples. The play of these various forces has given the British Empire a new form, which is full of complexities and shades of difference, which is constantly changing, and is sufficiently adaptable to preserve in every continent, on every sea, and under every climate the unity of a multitude of peoples differing in language, religion, economic system, and social organisation. Sometimes the descendants of the settlers form a really homogeneous nation ; at others the Anglo-Saxons are only a governing minority in a land of natives ; whilst in a few cases they comprise a mere handful of planters, officials, engineers, and merchants. This variety goes hand in hand with the homogeneous character of British colonisation. It may well be imagined that to keep together so many different elements it has been necessary to fashion an extremely adaptable form of organisation which makes the Empire easier to describe than to define.

The forms of government in use range through the whole scale from the most complete autocracy of a military governor to the most complete autonomy of a democratic constitution. The Empire is the outcome of long evolution in which a series of slow developments have ended in a complete change of form. Beginning with the independence of the United States and continuing after three-quarters of a century with the inauguration of the Dominion of Canada, it has in our times through tacit or express agreement reached a point at which the Empire has been led to call itself the

British Commonwealth of Nations. The Dominions of Canada, Australia, New Zealand, and South Africa have equality of status with Great Britain. They have their own armies and even their own navies. They can, if they so desire, have their own foreign policy. Canada, which is a real international power, is represented in Paris by a minister plenipotentiary ; and representatives of the Dominions have a place in the United Nations Organisation. The Governments and Parliaments of the Dominions are in fact absolute masters in their own countries. In practice they nominate the Governors-General who represent the common Sovereign. Southern Ireland has recently decided to sever its political tie with Great Britain and is no longer a member of the Commonwealth ; but the full significance of the step is not yet clear.

Apart from the Dominions, there are other parts of the Empire which are more closely associated with Great Britain. These are countries with responsible government, like Southern Rhodesia, which seems likely to become a Dominion in the near future. Then there are Crown Colonies and Protectorates, some, like Barbados, with elected Legislative Assemblies ; others, like British Guiana, British Honduras, and Cyprus, with a partly elected Legislative Council ; others, like Uganda, the Falkland Islands, Nyasaland, and the Gambia, with nominated Legislative Councils. To these must be added the so-called mandated territories, the Malay States, and territories shared under a condominium, viz. the Anglo-Egyptian Sudan and the New Hebrides. In 1927, Iraq ceased to be a mandated territory and became an allied state.

Lastly, the subcontinent of India, which is a world in itself, forms a peculiar element in the British Commonwealth of Nations. The country was long divided into the Provinces of British India, which were administered directly by British officials, and the protected Native States ruled by Indian princes. The Government of India Act of 1935 instituted a change whereby the provinces formed a federal union which the Native States were permitted to join. In consequence of this, each province had an elected legislature, and a federal parliament was established to deal with problems of general concern. The great variety of peoples, the low standard of education, and the caste system made these first attempts at self-government a delicate matter. In 1947 the subcontinent was given full Dominion status, but split into two portions, the Hindu and the Muslim, the former under the name of India, the latter of Pakistan.

It would be a mistake to look for volition, consciousness, and method in the achievement of unity in the political system of the Empire. What is this unity ? The constitutional ties which bind

the different parts to Great Britain are very slight and delicate. The first and most respected is the Sovereign. The King is the incarnation of unity. He is the monarch of all the British territories. He is the living, concrete image of the Empire. The Judicial Committee of the Privy Council is the supreme imperial Court of Appeal, but its authority has been disputed in some parts of the Empire. Statesmen have been seeking a constitution for the British Commonwealth of Nations, a constitution which will combine the principle of unity with that of diversity. But just as there is, properly speaking, no hard and fast British Constitution defining the rights of the individual, so there is no formal constitution for The Empire. In 1921, Mr. Hughes, the Prime Minister of Australia, said that 'the pillars of this Temple of Empire are firmly embedded in the rock of liberty. . . . The surest way of destroying this mighty Empire is to tamper with its constitution. Complete autonomy of its parts is the foundation upon which its unity rests. . . . This assurance of perfect liberty for each of the several parts ensures the spiritual unity which binds us together.'¹

To co-ordinate this policy, the representatives of the self-governing countries of the Empire meet in Imperial Conferences. These are in fact great imperial councils which meet as a rule about every four years. The first 'Colonial Conference' was held in 1887 on the occasion of Queen Victoria's Golden Jubilee. The Conference which met in 1907 was designated 'imperial.' The meetings are no longer necessarily held in London and may even be presided over by a Dominion statesman. In 1932 an Imperial Economic Conference was held in Ottawa under the chairmanship of the Canadian Prime Minister. The resolutions of the Conference have not the force of law, since they are not passed by an imperial executive body; but as they are reached by common consent, they base their strength on general goodwill.

The British Empire is not an anarchic state. Among its members reigns a unity, a corporate spirit which results from the possession of a common civilisation, traditions, ideas, ideals, language, and legal system; from the same fondness for liberty of the individual, for representative government, parliamentary institutions, and the King's person. There is thus a good deal of sentiment underlying imperial unity. It cannot be denied that this sentiment has not prevented the growth of a certain degree of national feeling or the appearance of material interests which are at times divergent; but it is the function of the imperial authorities to see that these problems are treated in such a way as to reconcile the demands of national interests with the realisation of imperial aims which un-

¹ *The Times*, May 24, 1921.

questionably exist in every part of the Empire. The first of the chief common interests is the closest possible co-ordination of the armed forces of the several parts for the national defence of each. In the second place, the vast extent of the Empire and its dispersion in every latitude make its various parts economically complementary. Hence, even before the world depression, trade between the various countries in the Empire was very active. The Ottawa Agreement and others which have followed in the same principle of imperial preference have acted as a stimulus to this trade. The Overseas Empire takes half the exports of the United Kingdom, Canada, South Africa, and India ; two-thirds of the exports from Australia ; and nine-tenths of those from New Zealand. It supplies one-third of the imports into Canada, three-fifths of those into Australia and the Union of South Africa, three-fourths of those into New Zealand, and half those into India and Pakistan.

But this close association is the result of the economic history of the several countries during the past centuries rather than of recent agreements. Account must be taken to-day of economic nationalism and of the growing industrialisation of the new countries, an industrialisation which is already in a very advanced stage in Canada and is making rapid progress in India. Centrifugal force inevitably obliges Canada to look towards the United States ; and similarly, Australia is turning towards the Pacific, and South Africa to the Indian Ocean. Each of these Dominions possesses a kind of empire of its own in its particular corner of the world. Since the war of 1914-18, Australia and South Africa have been administering vast mandated territories. The participation of the Dominions in the conduct of imperial affairs tended at one time to shift the centre of gravity of British interests towards the Far East, owing to the unwillingness of the new countries to concentrate their attention on the old states of Europe with which the British Isles were indissolubly bound up by geographical factors. This state of things gave rise to a serious problem of political geography. Would the young nations form dissident units which would eventually achieve complete independence ? Or else would they one day form a great federation, a single world-wide state which would include all the communities of the British world ?

The war of 1939-45 has provided some of the answers. The Dominions which have been formed from colonies of settlement have been welded together more closely, but misunderstanding on the part of the Mother Country of such local problems as the White Australia policy or the colour problem in South Africa might easily cause a fatal rift. The larger dependencies inhabited by native peoples have tended to weaken their ties with the Empire. India

and Pakistan achieved their independence, as Dominions in 1947 ; Ceylon attained a similar status in 1948 ; Burma has withdrawn from the Empire ; the Palestine mandate has been abandoned ; and Egypt, Iraq, and Trans-Jordan have completed their freedom. Thus, the Empire has greatly contracted since 1945 ; but at the moment the British overseas, whether Canadians, Australians, New Zealanders or South Africans, vie with each other in loyalty to the Crown and to their Commonwealth of Nations.

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